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**Public Hearings on
NOISE ABATEMENT AND CONTROL**

Vol. VIII

**Technology and Economics of Noise Control;
National Programs and their Relations with State and
Local Programs**

Washington, D. C. Nov. 9-12, 1971

**U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460**

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**CONDUCTED BY
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PREFACE

Under the Noise Pollution and Abatement Act of 1970 (title IV to the Clean Air Amendment of 1970 (Public Law 91-604)), the Environmental Protection Agency, through the Office of Noise Abatement and Control, is required to hold public hearings. A series of eight of these hearings was conducted in selected cities to aid the Office of Noise Abatement and Control in compiling information relevant to its investigation of the problem of noise pollution. Further, these hearings present an opportunity for the public and industry to express their viewpoints on the general subject of noise control. The volumes in the complete series will be:

- Vol. I —Noise in Construction
- Vol. II —Manufacturing and Transportation Noise (Highway and Air)
- Vol. III —Urban Planning, Architectural Design; and Noise in the Home
- Vol. IV —Standards and Measurement Methods, Legislation and Enforcement Problems
- Vol. V —Agriculture and Recreational use Noise
- Vol. VI —Transportation (Rail and Other), Urban Noise Problems and Social Behavior
- Vol. VII —Physiological and Psychological Effects
- Vol. VIII—Technology and Economics of Noise Control; National Programs and their Relations with State and Local

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ENVIRONMENTAL PROTECTION AGENCY

PUBLIC HEARING ON THE TECHNOLOGY AND ECONOMICS OF NOISE CONTROL; AND NATIONAL PROGRAMS AND THEIR RELATIONS WITH STATE AND LOCAL PROGRAMS

TUESDAY, NOVEMBER 9, 1970

The hearing was convened at 9:15 a.m., Dr. Alvin F. Meyer, Jr., Director, Office of Noise Abatement and Control, Environmental Protection Agency, presiding as chairman.

PANEL:

Theodore Berland, Citizens Against Noise

Dr. Leo Beranek, Bolt, Beranek & Newman

Ken Eldred, Wyle Laboratories

Dr. John Johnson, Acoustical Society of America

Mayor Wes Wise, Dallas, Tex.

Charles Dietrich, Bolt, Beranek & Newman

Dr. MEYER. I hereby call to order the Environmental Protection Agency's hearing on noise, being held in the city of Washington, District of Columbia, in the Shoreham Hotel, on November 9, 1971.

This hearing is held under a mandate from the Congress to the Administrator of the Environmental Protection Agency in title IV, Public Law 91-604. That act of Congress directed that the Administrator of the Environmental Protection Agency prepare a report to the President and to the Congress evaluating the noise problem in the United States, and making recommendations to the President and to the Congress on the needed action. The act also requires that the Administrator, in conducting the investigations leading to the preparation of that report, hold a series of public hearings—and this hearing is one of eight of such hearings—to achieve the purposes of the act; namely, to obtain information to be utilized both in the report and in the development of recommendations.

A few brief words about how the hearings are organized, what the end product is and how we will conduct them. The Government has invited a group of eminent and respected workers in the field of noise, or professions related to noise or otherwise associated with the problem, to assist in obtaining the necessary information.

I should like to introduce the panel members, going alphabetically: I am accompanied this morning by Mr. Theodore Berland, president of the organization Citizens Against Noise, and author of the book, "The Fight for Quiet"; Dr. Leo Beranek, of the Institute of Noise Control Engineers, and of the firm Bolt, Beranek & Newman, Cambridge, Mass., and a distinguished author and eminent leader in the profession; Mr. Ken Eldred, distinguished scientist and engineer in the field of noise control, a member of Wyle Laboratories; Mr. John Johnson, Pennsylvania State College and president of the Acoustical Society of America; the Honorable Wes Wise, distinguished mayor of one of the Nation's largest cities, Dallas, Tex. Later, we will be joined by Mr. Charles Dietrich, also of the firm of Bolt, Beranek & Newman.

These hearings are conducted under the rules similar to those of the Committee on Government Operations, of the House of Representatives of the United States. We utilize the rules that they generally follow in conducting field hearings of an information-gathering nature. Under those rules, no questions are permitted from the floor; only the panelists may ask questions of the witness. However, recognizing that there is sometimes great value in audience participation, we do accept through our staff a written question, which, if appropriate, will be asked or I will arrange for the person submitting the question to meet with the witness to get an answer to the question.

I might point out that in effect the panel is the audience. We are pleased to have so many people participate either as witnesses or to attend and obtain information which they may hear, but the real audience is this panel who is obtaining the information and who, upon completion of the hearing, will provide recommendations to the Environmental Protection Agency. Through the panel, the ultimate audience is the U.S. Congress, who will receive the printed transcripts of the entire proceedings.

Again, so that the record may be clear, the proceedings of these hearings, this one and all the previous ones, will be available from the U.S. Government Printing Office, the target date being sometime shortly after the first of the year.

Against that background, let us now proceed to the first witness, Prof. Richard Bolt, representing the Acoustical Society of America. Professor Bolt is a long-time worker in the field, and I would like to invite Professor Bolt to come forward and give his presentation.

**STATEMENT OF RICHARD H. BOLT, CHAIRMAN,
ACOUSTICAL SOCIETY OF AMERICA COORDINATING
COMMITTEE ON ENVIRONMENTAL ACOUSTICS**

Professor BOLT. Dr. Meyer and distinguished panelists, I am very happy to have this opportunity to contribute some information to these important hearings. I shall talk about just one subject, which I might title "The Acoustical Society of America: Professional Meeting Ground for Noise Scientists and Engineers."

The Acoustical Society of America is the largest, the oldest, the most widely representative professional society covering the broad field of acoustics. Even before I define acoustics, which encompasses environmental noise, I should like to give a few

facts and figures to show the growth and geographical spread of the society.

The acoustical society was founded in 1929 with a charter membership of about 450. During its early years the society grew slowly, even receding a little during the depression, and then it passed the 1,000 mark in 1945. Thereafter, owing in large part to the stimulation of wartime research and development, the ASA grew steadily and rapidly, reaching a membership of 2,000 in 1955, 3,000 in 1961, and 4,000 in 1967.

Today, in the year of its 42d birthday, the acoustical society lists a roster of about 4,500 persons. The count published by the society in June 1971 shows: Members, 2,464; fellows, 440; associates, 1,280; student members, 316, for a total count of 4,500.

Out of this number, about 500 are foreigners living in 46 different countries. Canada with 116 members leads the list. About three-fourths of the foreign members come from the following eight countries, and I am listing them by decreasing size of their membership: Canada, Japan, England, West Germany, Australia, Netherlands, Sweden, France. Each of these countries has more than 20 members.

The 4,000 domestic members are found in every State except one, in the District of Columbia, and in Puerto Rico and the Virgin Islands. Of the States, California with 575 members and New York with 398 have the largest numbers. These two States alone account for 24 percent of the domestic members. If we count all scientists and engineers who reside in these two States, we find that they also represent 24 percent of all scientists and engineers in the United States.

About three-fourths of the domestic members—that is, about 3,000—come from the following 12 States, including the District, listed by decreasing size of membership: California, New York, Massachusetts, Texas, Pennsylvania, New Jersey, Connecticut, District of Columbia, Maryland, Illinois, Florida, Ohio, and Michigan. Again, this same list covers nearly three-fourths of all scientists and engineers in the United States.

These facts show that the acoustical society is truly nationwide and worldwide in its coverage. They also show that acoustical scientists and engineers resemble scientists and engineers in general as to the way in which they cluster in certain parts of the country, in the more populous States, and in the regions that contain the higher concentrations of technological endeavor.

This similarity is not at all surprising to us acousticians, for the acoustical profession includes specialists from many different fields of science and engineering. The membership of the society includes persons whose education and training was obtained in such diverse fields as physics, chemistry, psychology, physiology, medicine, social sciences, music, architecture, and engineering disciplines, including electrical, mechanical, chemical, and aeronautical engineering. If the backgrounds are so different, what attracts the members together in one society?

The answer, of course, lies in the definition of acoustics. In pedantic terms, acoustics means the study and application of mechanical vibratory energy and its effects on physical objects and living organisms. Acoustics applies to solids and liquids as well

as to gases such as air. In everyday terms, acoustics has to do with sound and vibration in all its forms, including music, speech, and noise, and with the ways in which people and things react to sound.

So, for example, some members of the acoustical society design the acoustics of music halls and speech rooms. Some members develop sound systems or hi-fi equipment. Some teach the physics of sound or the psychology of hearing. Some quiet automobiles or ships or aircraft. Some design new musical instruments. Some conduct social surveys of community reaction to noise. Some use ultrasound for medical diagnosis. And the list goes on and on. But looking at all the things that acousticians do give us a vivid definition of the field.

Now let me narrow down my remarks and relate them specifically to the interest of these public hearings being held by the Environmental Protection Agency. The interest here is environmental noise and the central theme of today's hearings takes in national programs related to noise. My task is to describe the national program of the Acoustical Society of America as the general meeting ground of scientists and engineers working on problems of noise.

The basic purpose of the Acoustical Society of America since its founding has been "**** to increase and diffuse the knowledge of acoustics and promote its practical applications." The society serves this purpose through many kinds of activities, including national meetings, publications, technical committees, and regional chapters. Activities of each kind serve to further the advancement of knowledge about noise and its practical applications.

National meetings held twice a year typically draw 500 to 1,000 attendees. More than 700 persons registered at the most recent meeting, the 82d meeting, held in Denver, Colo., October 19-22, 1971. Out of some 360 technical papers presented at the meeting, about 60 reported on studies in environmental noise and another 60 provided basic information about noise. The papers were given in sessions on topics such as noise standards, progress in noise control, measurement and reduction of product noise, vehicle noise, sound absorption and transmission, and aircraft, airport, and community noise.

Turning now to publications, the Journal of the Acoustical Society of America has been published every year since 1929. In that first year the journal carried 163 pages and eight technical papers. The 1970 journal ran to almost 3,000 pages and 300 technical papers. This makes it the largest, regularly published professional journal serving acoustical scientists and engineers. It is read around the world and its technical quality is held in high esteem, as I have learned from comments made by colleagues in many countries. Specialists in noise are served by this monthly journal in several ways. Results of research and new developments are reported in the regular technical papers, of which 22 were categorized under the noise specialty in 1970. In addition, many research papers in other categories contribute basic knowledge relevant to noise, such as papers on the psychol-

ogy and physiology of hearing, on the masking of speech by noise, on the physics of sound wave propagation, and on instrumentation.

Besides these technical papers, the journal prints the abstracts of all papers read at the national meetings of the society. The 1970 journal carried 100 of these abstracts under the category of "noise" and at least as many again in closely related subjects.

Another section of the journal describes new patents, of which 63 relating to noise appeared in 1970. Many of these patents show muffling devices for noise sources such as engine exhausts, jets, turbines, test cells, office machines, and firearms.

A news section in the journal includes items on society events, government activities, appointments and honors received by members, and educational opportunities. For example, a recent issue of the journal lists undergraduate and graduate courses in acoustics taught on 135 campuses in this country.

A foreign news section announces and reports on conferences and international congresses of interest to workers in Noise. The first 10 issues of 1971 carried items on activities in 12 countries: Canada, Czechoslovakia, England, France, Germany, Hungary, Netherlands, Poland, Scotland, Spain, U.S.S.R., and Venezuela.

Other sections of the journal publish technical notes and research briefs, letters to the editor, and extensive listings of current publications in other journals, government reports, and books.

Next, technical committees, established on a permanent basis by the society's constitution, carry out much of the substantive activity of the society. In each of nine committees, specialists in a particular branch of acoustics get together to advance the work in their specialty. These technical committees arrange for symposia and sessions of technical papers given at the meetings. They encourage or produce special publications. They survey work in their field of specialty and contribute to the development of technical standards. They prepare bibliographies and pamphlets and collaborate with other professional associations. At present, 186 members are serving on these committees, which are coordinated by a technical council.

The technical committee on noise is the society's main focus of interest in problems of noise abatement and control. In addition, some of the scientific work overseen by the committee on speech communication and the committee on psychological and physiological acoustics contributes to the development of criteria for noise control. The architectural acoustics committee considers noise environments in buildings, and the engineering acoustics committee interests include measuring instruments and noise from equipment.

Regional chapters for many years have provided local opportunities for acoustical society members to get together, to hear guest speakers, and to discuss technical problems. The society's central committee on regional chapters gives general coordina-

tion to these activities, but each chapter elects its own officers and plans and conducts its own programs.

Regional chapters are now operating in 17 regions designated, Austin, Boston, central Pennsylvania, Chicago, Delaware Valley, Georgia, Houston, Huntsville, Los Angeles, Michigan, Narragansett, North Carolina, Northwest, San Diego, San Francisco, Washington, D.C., and Minnesota.

Early in 1969, the three chapters located in California combined their efforts to develop an experimental program in public service regarding the control of environmental noise. The activities included interactions with State and city governments, serving on advisory councils, and offering public lectures and tutorial sessions about noise.

These activities in California were symptomatic of concerns being discussed quite widely by regional chapters, by technical committees, and by many individual members of the acoustical society. They asked questions such as these: Is the society emphasizing basic science to the detriment of practical applications? Do environmental problems, which so widely affect the general public and its governing bodies, require new ways of communicating technical information about noise? Should the acoustical society put greater efforts into helping the public understand the effects and control of noise? If so, how?

Questions such as these reached the highest level of the society's management, the executive council, which includes the officers. The council then set up a committee on upgrading the effectiveness of the society, to examine the questions in depth and to recommend actions. In response to some of the recommendations brought back, the executive council early in 1971 established the Coordinating Committee on Environmental Acoustics, called CCEA for short.

The general purpose of the CCEA is to help the acoustical society contribute more effectively to the solution of environmental problems involving acoustics. The membership of the CCEA includes representatives from each of the technical committees involved in a specialty that relates to noise. These representatives will assist the new CCEA in coordinating the many relevant activities of the society without engaging in unnecessary duplication of effort.

During recent months the CCEA has organized its program around six working groups. Some of these groups are preparing summaries of the state of knowledge about certain basic aspects of environmental noise. One group is forming a national program to assist society members who wish to offer public lectures on the subject.

Setting up this kind of public service activity in a scientific and engineering society raises some basic issues. For example, in the matter of maintaining scientific quality, how should the responsibility of the acoustical society relate to the responsibilities of its members who offer public services? What activities can the society undertake without competing against the members it was founded to serve, such as those who perform engineering services professionally? What is the nature of accountability of the society for the information and advice it may

give? These are some of the issues we are now working to resolve before the society moves vigorously into activities in the public domain.

Most of the information that I have given in this testimony can be found in the pages of the Journal of the Acoustical Society of America. Subscriptions to the journal or individual copies of it can be ordered from the American Institute of Physics, 335 East 45th Street, New York, N.Y. 10017.

No brief presentation such as I have given here today can do justice to the extensive and highly dynamic activities of the acoustical society. Even concerning those activities that relate directly to the abatement and control of noise, I have had to omit many important details. Nevertheless, I hope that I have succeeded in conveying the following ideas: (1) the Acoustical Society of America is recognized around the world as the professional mecca of acoustical scientists and engineers. (2) Its members have given leadership to the advancement of knowledge about acoustics during the past 40 years. (3) The many scientific and engineering disciplines found in the society collaborate to develop all aspects of the technical knowledge that underlies the solution of problems in noise. (4) From the time of its founding, the society has committed itself to the diffusion of knowledge and the promotion of its practical applications. (5) Through a searching reassessment of its programs during the past 2 years, the society has recognized that effective application of knowledge about environmental problems in noise, as distinct from traditional problems in the private sector, calls for a widening of the society's interactions with Federal, State, and local governments, citizen groups, and the public at large. (6) In response to the new need, the society this year established the Coordinating Committee on Environmental Acoustics, to help all relevant units of the society achieve a more effective communication with the public sector concerning the problems of environmental noise.

As chairman of that committee, I have been privileged to offer this testimony today. I shall welcome your questions, and your suggestions as to how the Acoustical Society of America can best help the Environmental Protection Agency bring about a more livable noise environment.

Dr. MEYER. Thank you, Professor Bolt. I would say one thing before asking the panel if they have any questions. The acoustical society is already helping in bringing about a more livable noise environment through the measures summarized at the conclusion of your statement. I will now ask the panel, beginning on my left, if they have any questions. Mr. Martin? Dr. Beranek?

Dr. BERANEK. I would like to ask Dr. Bolt, if I might have permission to say a word about the Institute of Noise Control Engineers, of which I am president, Mr. Chairman--

Dr. MEYER. If you would like to assert some comments on it at the end of the record, yes, sir, I will accept it.

Dr. BERANEK. Could I ask the speaker how he sees this fitting into the national picture?

Professor BOLT. Yes. In response to the interest that EPA has shown in the professional activities, put together by the acoustical society, I deliberately made my presentation talk only about

that one organization. However, this society certainly is not working in a professional vacuum. There are many other organizations whose work relates in one way or another to problems of noise and the noise environment. There are many organizations in the area of standards, for example, that I did not mention. There are other societies, such as the Audio Engineering Society, and several of the large engineering organizations such as the Triple E, in electrical electronics engineering. Also, there is an International Mission on Acoustics, which holds international congresses every 3 years and many other things in between.

One in particular is interesting; it is quite new. I think only about a year ago a number of persons who were members of the acoustical society and who were particularly interested in the engineering of noise control, got together and formed a new organization which is called the Institute of Noise Control Engineers, to serve certain specific professional functions which the acoustical society, as a basic scientific and engineering society, has not undertaken. I think it will be very interesting to hear a few words from the president of this new Institute of Noise Control Engineering.

Dr. MEYER. The Chair will give the president of the Institute of Noise Control equal time.

Dr. BERANEK. The Institute of Noise Control Engineers is a group of members of the Acoustical Society of America who want to do something a little different than the Acoustical Society of America would believe that its charter allowed it to do because of its organization under the IRS regulations. We would be organized to go into one area of the acoustical society normally does not go into; namely, the certification and registration of noise control engineers.

This institute of noise control engineering is going to be sensitive to the needs and responsibilities of the noise control engineer, who is dedicated to a leadership role in applying noise control technology to the benefit of mankind. It would try to unite in common purpose the noise control engineers in this country to serve as the corporate body which supports and regulates the membership of the profession, and to promote the recognition of noise control engineering as a technical profession requiring both formal training and practical experience. It will, of course, help communicate with governmental bodies, and it would define minimum standards of technical competency for noise control engineers by means of written and oral examinations, and measure the capability of individuals against these standards and certify these individuals as having satisfied these minimum requirements. It will then attempt to get appropriate State licensing courts to recognize this type of registration.

Then in great cooperation with the acoustical society, of which all the members of this institute must be members, it would, in cooperation with them, provide channels of communication through publications of one kind or another, and public meetings, and we would attempt to work with the Federal Government and State and local governments in providing them

with effective and responsible noise control information and services.

This might bring up a question as to whether there ought to be a formal committee, which would be interagency and intersociety, that would act to help the Government, since you mentioned other societies.

Dr. MEYER. Professor Bolt, I believe the question is reduced to this: In your position as the chairman of this coordinating committee of your society, how do you see the possibility of establishing intersociety committees with the Institute of Noise Control Engineers, or the American Institute of Architects, whom we are going to hear about later on this morning. There is the Society of Mechanical Engineers, who for many years have had standing committees dealing with noise problems—associated with machinery, as I am sure you are aware. Mr. Martin represents the Society of Automotive Engineers as they, of course, do a lot in this. The Government has to hear many voices speaking on the same subject, which sometimes contributes to the noise level which we are exposed to in trying to make decisions.

I guess the question is, how do you feel about some sort of coordinating effect to get at this problem, and who ought to take the leadership? Should it be the Government? Should it be the acoustical society? Should it be spontaneous from the various concerns?

Professor BOLT. That question, of course, opens up a very complex set of activities going on today, not all of which are yet in public view. Let me mention one that I am involved in as the representative of the acoustical society through this new Coordinating Committee on Environmental Acoustics.

In a very quiet way during the last 8 months, a representative from each of 16 or 17 professional societies has been meeting to plan a conference which, at the moment, I think we are calling by the cumbersome name of Inter Society Conference on Improving the Quality of the Environment—something of this sort. The substantive focus of this conference has been restricted to the environment, air quality, water quality, noise and so on. But the real purpose of this very special kind of conference is to see how we might, in this country, pull together a truly effective working partnership among professional associations, such as the acoustical society, whose work impacts upon the public at large.

Let me just mention some of the other groups involved in this activity: The Institute of Electrical Engineers, several other engineering societies, chemical engineering and so on, the American Bar Association, the American Medical Association, the American Association of Public Administration—if I have the name correct. This is truly a very wide spread of professional representation, representations of the various kinds of subjects that must come together in solving real problems in the real world.

The science and the engineering inputs are only part of the problem. There are sociological problems, medical, health, legal problems, all of which must be pulled together through the political process in achieving a consensus as to what the public wants to be done about a problem.

The thought of the group that is putting together this intersociety conference is that we must walk before we run. What is more, we must walk with each other before we can effectively, representing the professional disciplines, walk with the public at large. We hope that this conference, which will be held within a year, will be a first step toward establishing a very wide multidisciplinary, multisectoral approach to better collaboration between the professions and the public and their governmental representations.

Mr. MARTIN. I might just offer another comment: I serve on the American National Standards/Acoustical Standards Board, and that body serves as a mechanism in the standards field for putting together the intersociety government agency type of discussion in this field, but only in the field of standards. It complements what you are doing in the society.

Professor BOLT. If I may respond to that, I am glad that you brought that point out. Testimony at least as extensive as the one I gave about the acoustical society could, of course, have been given about the American Standards Institute and other organizations.

Mr. WISE. Dr. Bolt, a couple of statements, and then my question. Dr. Meyer would certainly know that he was correct in his statement that the decibel level is quite high in the Government operations. If he had been in my city council meeting yesterday, this would have been proven beyond any doubt.

I am a little bit concerned that your society would choose Houston as one of its places of operation instead of Dallas/Fort Worth, the No. 1 location in Texas.

Professor BOLT. We believe very much in State rights.

Mr. WISE. Do you feel the liaison and relationship between your society and political or governmental entities, such as the city council particularly, which would be most concerned about this thing, is sufficient? How would you assess it at this time?

Professor BOLT. I am not sure that a communicating relationship is ever fully sufficient. Learning to talk together and work together among different activities in our society is a continuing problem on which we must press. Your question does, of course, again touch on some of the comments I was making toward the end of my testimony. You see, our organization, like other scientific societies, is basically a professional organization concerned with developing new knowledge through research, with disseminating the knowledge through education and diffusing the knowledge through publications into application. It is not concerned with political action.

The big question here is, How do you operate as a scientific organization, satisfying, if you will, the values of pure truth, of objective information, and at the same time help to serve the public sector and the political domain which operates with its highest value as the responsibility? This is the question. My own personal feeling is—and many of my friends in other organizations are now discussing this complex relationship, who agree with me—that the purely scientific organizations, without in any way abandoning objectivity and truth and information, can do much more than they have in interpreting and explaining

the information, so it can really be understood by a much wider audience, in helping the public community and the governments to translate the technical knowledge into specific terms, and especially in using their scientific understanding to visualize various alternative futures that might occur. If policy A is put into effect, this might be a technical consequence, not a political judgment, and to put assessments, if you will, on each of the alternatives that might be chosen politically.

If we go down this course, this is the value we realize technically and this is the cost. If somehow we can learn to participate more closely with government bodies in assessing the cost and benefits of alternatives, but carefully drawing the line as professional organizations not to participate in value-setting judgment, this, I think, could be of real help to our society.

I should quickly add that each of us, no matter what we do in life, wears several hats. As a scientist, I am also a citizen very much concerned about the value to our society. At this moment I am making a purely technical statement. As another act, I will go to the polls.

Mr. WISE. I believe there is a reluctance on the part of some professional societies—I am not really saying yours because I am not that familiar, frankly, with yours—to get themselves involved in the political operation. I think this is unfortunate because this is the human operation and it is the one through which eventual action will take place one way or the other, though I recognize the professional aspects, the ethics that you would have to bear in mind.

Mr. MARTIN. If I could add a comment, being from a professional society, let me add to what Dr. Bolt has said and answer your question a little further. We in SAE have wanted to do this many times, but we have a very difficult constraint to work with, called IRS. Because of our tax situation, being a non-profit organization, it is virtually written into the rules to eliminate us from working in the political arena. We can only work in the technical atmosphere, as Dr. Bolt has said.

Those of us in the noise field generate this technical information; we generate standards that any government body can pick up and utilize within their own realm, but it prevents us from getting involved in any way with a government group writing a regulation because this becomes a lobbying effort, and IRS presents a professional society, if it wishes to maintain its tax exempt status, from doing this.

Mr. WISE. A governmental entity can avail itself of these papers.

Professor BOLT. Indeed, and it takes two to tango.

Mr. WISE. There is more responsibility from their side than yours?

Professor BOLT. Indeed.

Dr. BERANEK. This is one reason why the society was formed, to help the governments make the decisions in the political arena. All the same standards that Dr. Bolt has listed would apply to the membership here, but in addition they can speak out without fear of getting into trouble with the IRS.

Professor BOLT. The last of the three comments lead me to generate just one more thing. The discussion going on in this country among scientists and engineers is very widespread and intense, concerning just this thing: Should we or should we not do things that will help in solving societal problems? And probably nowhere is this more strongly focused than in the American Organization for the Advancement of Science, with some 30,000 members and many times that number that adhere to the Triple A's.

I am on the board of directors of that organization, and we have set up a new youth council, for example, to help us look at this, special committees to help us investigate on how can the scientific community be more accurate. At one extreme there are scientists who say we are copping out; we do not go in and make a stand for a particular political decision. I would think that the voices with the longer range would say we are only copping out if we have not done our very best to convey what we know to the decisionmakers and to help them assess these alternate consequences. As scientists, we do not have to try to make a political decision.

Dr. MEYER. We have heard quite a bit of dialog between the witness and the panel and between certain members of the panel and each other. Now I ask another viewpoint on the panel. Mr. Berland, do you have a question?

Mr. BERLAND. I have two. I could not find any place in your testimony where you state what the qualifications are for membership in your organization. Can you do so briefly?

Professor BOLT. In a sense, I was giving testimony as a student before his senior professors. The president of the acoustical society is a member of your panel, Dr. John Johnson. I would like to ask him if he would be willing to answer that question.

Dr. JOHNSON. We have a membership committee which reviews the credentials of anyone who applies. We have five different types of members, the four that Dr. Bolt mentioned earlier, plus one that is called honorary membership.

It is the job of this membership committee to review the credentials to determine whether the person has certain technical qualifications. I might mention that this is not an easy job because of the breadth of the field, all the way from psychology on one end to physical acoustics on the other. It is the job of this committee to determine whether a person who has made application has competence in any of the fields of acoustics, to evaluate his educational background and to evaluate his performance demonstrated thus far in the field. We do not have strict criteria that say a person must have a particular degree from a particular type of university; nor, on the other hand, do we say that anyone who is interested in acoustics may join.

In a way, I guess I cannot be too specific in answering, except that I can say that in general they do expect membership, for anyone who becomes a member, to have had some formal education in acoustics. They would expect him to have demonstrated his interest by performance. This is at all levels except the student level. The student level is a special level, and there the person must be studying a relevant field, so I think you can

see that that would have a different level of membership qualification.

Mr. BERLAND. You have to go before the board?

Dr. JOHNSON. The committee makes an evaluation. In earlier years, there was a time when they said anyone who is interested in acoustics is welcome to join. It soon became evident that we were losing the character of the society when we did this. That is the reason why evaluating each application was set up.

Mr. BERLAND. Maybe Professor Bolt will answer this one. I wonder how your ivory tower organization could work with the organization such as the one I am concerned with and familiar with, which is the citizens action group, Citizens Against Noise? I am very happy to hear that through the efforts of your committee and yourself the Acoustical Society of America wants to step down from the ivory tower and get down into a more active role. How do you see the acoustical society working with organizations such as Citizens Against Noise, citizen action groups?

Professor BOLT. As I mentioned, the three regional chapters of the acoustical society, the San Diego, San Francisco, and Los Angeles chapters, got together a few years ago to participate more widely with the public, including citizen groups such as the one you mentioned.

In our CCEA activities, we are looking very carefully at this process of regional chapters of our society, as well as individual members on a local basis, attempting to assist citizen groups such as this. What we hope to have come out of our present study is a set of guidelines, and they would have suggestions in them much like the ones we were discussing a few minutes ago: How to draw the line between scientific information and advocacy, for example. I think we can be much more helpful to citizen groups than we have been in the past—if we go beyond saying you can find the answer in the pages of the acoustical society's journal, because there the answer is in technical terms; if we assist by explaining face to face what the information means, and helping to draft the information; write it up in lay language, or to assist citizens in putting it into whatever form they find useful for their purpose.

So far as the ivory tower is concerned, you know the long and distinguished history of science, going back 2,000 years, shows that more often than not it was outside the ivory tower that the stimulus for scientific endeavor took place. This is true from the time of Archimedes and through Galileo and right on up to the present day. In a sense, what we scientists are trying to do is bring about a more sensible balance. We must look at the outside world to see certain problems, and use this as stimulus to generate new knowledge. I think it is our responsibility then to see that the new knowledge gets back into the practical world to help society.

Mr. BERLAND. When you get out of the ivory tower you find out it is a very noisy world indeed.

Dr. JOHNSON. I have two or three questions. First of all, you mentioned the Coordinating Committee on Environmental Acoustics. You mentioned you had six groups. You named only

one of these on lectures. I wondered if you might expand on the activities of that committee.

Professor BOLT. Three of these groups are trying to pull together a statement about what we know and what we do not know today about certain substantive aspects of noise. For example, one of these groups is looking at the problem of the propagation of noise from a source, which might be a truck on a highway, to a receiver, which might be a person sitting in his livingroom 1,000 feet away.

The propagation of sound is a very complex thing. The sound spreads out. It is bent up and down and sideways by temperature gradients, room temperatures, it is absorbed by the ground and trees and so on. There has been a tremendous amount of work going on for many decades, studying the way sound travels through the atmosphere; but we still do not have a good summary statement of what do we know and what do we not know, and what kinds of scientific questions should be answered through research in order to help establish standards for noise traveling away from the highway, for example.

And so one working group is a working group on the propagation of sounds in the atmosphere. A second working group is looking at one of the most all-pervasive sources of noise in our environment, which is traffic from the highway, motor vehicles and trucks, and this working group is trying to identify very specifically the particular sources of noise in motor vehicles, the tire on the road, the noise coming through the engine block, the exhaust noise, the aerodynamic noise. Out of its white paper will come a summary of what do we know, what don't we know, and what new research must we do to gain a fuller understanding of all kinds of motor vehicles—automobiles, trucks, motorbikes, and so on.

A third working group is working on what we know about the interactions of noise with man; what are the many ways in which the noise environment can adversely affect human beings, affect their hearing, affect their speech communication by masking out the speech; affect their quality of life through annoying occurrences of noise, and so on. These are three of the working groups.

Another working group that I mentioned is studying the problems of providing public lectures. We are helping this working group to put together at the national level audiovisual aids and writeups of material that might be used at public lectures.

Another working group is going to consider putting together very special bibliographies on technical information concerning noise, bibliographies that could be more useful than the ones that we have today for citizen groups and government organizations and so on.

Another working group is looking directly at these policy questions that I raised, and this working group will attempt to put together a set of guidelines to help society members interact effectively.

Dr. JOHNSON. You also alluded to the educational questions, the society's participation in this subject. Since the society has been active both in matters of providing better education and

also trying to determine what is the manpower situation, what is the requirements for education, I think it would be well to put forward the information regarding these activities. Since I have been personally directly involved in this, I would be glad to fill in anything you may wish to say, but I would like to have you give any comments you may have on this.

Professor BOLT. First, you remind me that I omitted mentioning one of the important working groups of the coordinating committee on environmental acoustics—this is the working group on education and research. This group will undertake several tasks. One of them is to look at the research needs in technical areas of noise; but to look at these needs not purely in scientific terms, as we generally have done in the past, where we say if only we could understand more about this physical interaction, then we could answer this scientific question over here, but rather to establish needs in terms of practical requirements. This working group would look at the papers that I mentioned earlier on what we do not know as well as what we do know about certain areas of noise and its generation and propagation, and then would attempt to stimulate support of research in those particular areas where, if we knew more, we might be able to do a better practical job. This is one of its functions.

The other function that goes along with research is the education that goes toward doing this research—a professor doing research, his graduates doing research, research in a government agency, research in a company. So this committee is also going to look at educational needs.

For example, when it begins to see the magnitude of new research that is needed in this field through its own efforts and those of the other working groups that I have mentioned, it is going to be able to estimate our field needs this much more in the way of education. We should try to increase the number of persons, increasing bachelors, masters, doctorate degrees in such fields, because here we have such large gaps we need more students, or here we have large-scale engineering problems and we need more, so this group will help to stimulate education. It is important that as we stimulate education and research on the basis of practical needs of the noise environment, we should not undercut the continuing stimulation of education and research for purely scientific purposes.

Our problem is to keep these two in balance. Over the long haul it is the pure basic research that lays the foundation for the future. I might say, incidentally, that the extraordinary vitality of basic research in acoustics, the basic needs of psychology of hearing and neural research mechanism, basic research of turbulence and how this leads to the generation of noise by jet engines, extensive basic research going on over the last 40 years has made it possible at this moment in time when the public is making great demands on improving the noise environment, has made it possible for us to step forward immediately with ideas of solving the practical problems. We do not need to cut off this type of study, but we need to balance it with more research and more education.

Coming back to your question, Dr. Johnson, the very sketchy information I gave about educational opportunities, I took from the detailed paper that you prepared as a result of a survey done by the acoustical society listing educational opportunities. Perhaps you would like to fill in just a little more about the status of educational acoustics in this country.

Dr. JOHNSON. I think it would be good to have on the record the basis of where we stand now as we look forward and focus on the particular field of environmental acoustics.

Dr. MEYER. Could you summarize that very, very quickly and perhaps we can insert in the record the rest of this. We do have a fairly large number of witnesses today. I do not want to close the discussion, but I do want to give the panel a chance to talk and also to get on with the rest of the witnesses.

Dr. JOHNSON. In 1963, the acoustical society formed a society on education, and among the tasks that this committee undertook was to determine what are the manpower needs. In other words, is there a demand for more education in the field of acoustics? They did two things. They studied what is now being offered in the field of education and what are the manpower requirements. This exercise was repeated at the end of 1969 and again at the beginning of 1970.

The results were very similar. Approximately what is needed is 550 people to graduate per year to fulfill the needs of acoustics. That is based on those two surveys. It is true in 1964 and again in 1970. Of these, about 30 percent were in engineering. There are many other fields, such as architectural acoustics, musical acoustics, noise, physiological acoustics, psychological acoustics, shock and vibration, speech and communication, and underwater acoustics. These are the particular fields in which we made our investigation.

I might say that as far as the membership interest is concerned in the society, about 20 percent of them have noise as their first or second field of primary involvement. I think that is all I need to say in summary.

Dr. MEYER. Do you have another question?

Dr. JOHNSON. I think I will let it go because of the time.

Professor BOLT. If I could just add a comment to that, Dr. Meyer. There is an interesting thing about the field of noise or the general field of acoustics that I think differentiates it from almost any other technical field you can name in the circumstance it is not there or it is there by coalition. Those 4,500 members of the society, there are very, very few whose formal degree was called a degree in acoustics, like a doctor in acoustics.

So far as the educational profession is concerned, I once held the title "Professor of Acoustics" at Massachusetts Institute of Technology. I doubt if anyone else has ever held the title of "Acoustics." Instead, they are professors in physics, mechanical engineering, aeronautical engineering, psychology, medicine, and a long list.

In the acoustics laboratory at MIT, we provided the thesis research done on degrees in nearly every department at that institution over a period of time. What I am trying to say is this: This is a field that, from the beginning, necessarily was

highly interdisciplinary. We hear this word "interdisciplinary" research. We see government bodies trying to push universities into becoming more effective in developing interdisciplinary centers and interdisciplinary activities. It is built into acoustics. Because of this, you will find in the United States at this moment the available manpower, knowledge, and understanding to carry on very much more work in research and development than is today being undertaken. Acoustical people are not out of work, but if they are not doing something in the field of noise they are working on some other problem because of their very broad training. We could greatly accelerate our program if we could attract people who work in the field of noise by increasing our program.

Dr. MEYER. I have one last question. It has been an interesting discussion of what might be termed the biological or biopolitical role of the acoustical society, or other professional societies, in dealing with sociological problems, and also the relationships between different societies with different focal points.

In line with that, does the society have any information as to the number of persons on its committees who are members of other societies or associations with similar interests? As a follow-on of that question, does it have any information as to the number of its committee members who are members of similar working groups? You mentioned, for example, the automobile problem. The Government knows other societies are concerned with this. What is the overlapping, for instance, of the membership of your committee on automobile noise and that of the Society of Automotive Engineers?

Professor BOLT. I think those are two questions very relevant on the subject. I have not put together questions on the subject. I would like to ask Dr. Johnson if he has.

Dr. JOHNSON. I do not have real statistics, but I can say in general there is very little overlap. We do conscientiously try to have one person who is a member on a like committee and another society. This is not organized as well as it should be, and I am afraid there are many places where we do not have this one person on overlap. I do not believe we are duplicating by having a lot of people that are on the same like committee with two different societies.

Mr. ELDRED. Just one short question, Dr. Bolt. In your testimony you went into quite a bit of detail about the erudite technical journal of the Acoustical Society of America and the new committees that are being formed now to deal with some other issues. I think it would be worthwhile if you could expand for a minute at least on the standards activities the acoustical society has performed over the last 35 to 40 years in methods of measuring noise and methods of evaluating effects of noise on people. I think some of this work is a major output that is used by the public in practical use.

Professor BOLT. Yes, and it is in the form of standards that the practical output of acoustical knowledge very often is seen by the public; for example, standards on audiometers, for testing the amount of hearing loss that a person may have. These audiometers are used throughout the world. We talk about deci-

bels and dbA and very specific physical quantities of sound that you measure. A sound level meter today must be calibrated in accordance with an established acoustical standard, which result from the work of acoustical society members back several decades, as a matter of fact.

The particular way in which the standards evolve from, first, scientific knowledge and then laboratory attempts, and then preliminary standards which are tried out in the field, and finally adopted as American standards, and then as international standards, is an interesting and somewhat complex process. I do not know whether Dr. Johnson or Dr. Beranek would like to say just a little more about the way in which the society collaborates with international organizations in the final achievement of standards for public use.

Dr. BERANEK. If I may make this statement, I think it is better to say that there is great interchange of scientific knowledge and technical knowledge through international meetings and conventions and attendance at American Acoustical Society meetings by foreign members that these things evolve in parallel throughout the world. At the same time we in the institute of standards are working on a new standard in this country, you will find the work springs up and goes ahead simultaneously in Europe, and the standard that results is likely to be almost the same, except we may pay a little more attention to the English system of units than the rest of the world does. This kind of close cooperation is one of the best things in this field.

Dr. MEYER. The record should show that those who are interested in a review of what has been done in the field of standards should refer to the transcript of the San Francisco hearing, in which considerable discussions, including presentations by the American Institute of Standards, are included.

There being no questions, thank you very much for providing a most stimulating presentation and for eliciting from the panel the variety of comments and discussion which arose.

At this point I should like to proceed to the next witness, Mr. Norman R. Bergrun, representing the California Society of Professional Engineers, the Los Angeles chapter.

STATEMENT OF NORMAN R. BERGRUN, THE CALIFORNIA SOCIETY OF PROFESSIONAL ENGINEERS

Mr. BERGRUN. Thank you very much. I want to say that on behalf of Dr. Lumsden, whose paper I will be giving here, I thank you for this opportunity of being here in Washington. Actually, I find myself wearing two hats today. I am vice president of the chapter of the California Society of Professional Engineers in the area, and headed up a task group to define a role and involve our engineers in the problems of noise pollution. I am also a member of the Nielsen Engineering & Research Co., and Dr. Lumsden is a member of our board of directors. Were it not for this association, why, this paper would not be possible. Dr. Lumsden has been called away to San Diego and is unable to present his paper. He has asked me to convey his regrets to the panel in this regard.

Continuing with the paper, "The Economics of Noise Pollution," it is important to understand why pollution—air, water, noise—arises in our, or any society and why it is allowed to persist. Such understanding is necessary if rational decision-making is to prevail in the pollution field.

In consuming many goods and services an individual, in the terminology of J. S. Mill, is involved in a self-regarding act, or in the terminology of the economist, is creating no externalities; all the benefits accrue to the consumer with no positive or negative spillovers. For certain commodities, however, individuals other than the consumer are affected by his act of consumption. The attractively painted house, the well-kept yard, the growing of trees and flowers, can all yield satisfaction or utility to neighbors who did not contribute to the cost of such commodities; indeed, one can imagine a situation in which neighbors would be willing to pay you money not to cut down trees in your own property. At the opposite end of the spectrum certain acts create negative externalities; the riding of a noisy motorcycle in a residential area yield benefits to the rider or consumer but at the same time imposes costs (or yields negative benefits) to residents. The rider is performing an "other regarding act." Recognizing this distinction between "self-regarding" and "other regarding" acts or activities which do not and those which do create externalities, many people argue that societal laws should be concerned only with the latter category. Others argue for sumptuary law and existing legislation penalizes acts of homosexuality, marihuana smoking, suicide, the wearing of motorcycle helmets in California and so on.

In the "wonderful world" of perfect competition with no externalities economic efficiency is achieved with the last dollar's worth of resources used in industry A results in the same level of satisfaction or utility as the last dollar's worth of resources used in industry B. If this equivalency condition did not hold society could increase its well-being by switching resources until equality were attained. Competition between buyers and competition between sellers operating through the market mechanism insures economic efficiency; the consumer is sovereign. Resources flow according to his wishes reflected in dollar votes and the impersonal market insure that goods and services are produced at least cost. Whether such a system is just or equitable, whether or not individuals should be rewarded according to their contribution to the production of goods and services, whether or not any initial distribution of wealth is good or bad are normative issues not subject to economic analysis. However, it is the ownership of wealth, especially property, or rather the laws governing property ownership, which are at the heart of the externalities problem.

For example, if we return to our noisy motorcycle example, it is obvious that if an individual owned sufficient property he could insure no disutility from motorcycle noise in his residence by barring all motorcycles from his private property. If all property, including roads, were privately owned and if vehicles were allowed on private roads only if certain noise pollution standards were met, a noisy motorcycle would be restricted to

its owner's property. It is precisely because many of our resources are not and cannot be privately owned that pollution—water, air, and noise—emerges as a problem. To help clarify the issues involved consider the following example. Imagine that a firm producing chemical is located on the banks of a river which the firm also owns. If the firm dumps waste into the river a large number of salmon die. Here let us assume no other benefits, such as scenic, are derived from the river. In making the rational decision as to whether or not chemical wastes should be dumped in the river, the firm will decide if the resulting decrease in value of the river as a fishery would be greater or less than the costs of other methods of chemical waste disposal. If, on the other hand, the river is publicly owned and the chemical firm will ignore the costs of dumping waste in the river and use the river as its, not necessarily society's, cheapest method of waste disposal, the price of chemicals will not reflect all production costs—the price will be too low—too many chemical products will be consumed—society will be subsidized consumers of chemical products—a redistribution of real income in favor of the chemical products consumers will result—economic efficiency will not be achieved.

If the government, local or Federal, wishes to promote efficient use of resources, what should it do? Should it allow river use to be determined in a free market? Should it prohibit the chemical producer from dumping wastes into the river? The answer to both questions is "No." The Government should allow the chemical producer to dump waste in the river if it wishes, but should charge the firm the decrease in the value of the river as a fishery.

The general rule for economic efficiency is that resources should be allocated until the last dollar spent on any one commodity yields the same satisfaction to society as the last dollar spent on any other commodity.

Given the fundamental fact of scarcity of resources, less pollution must mean fewer other goods and services. Thus, if society wants less noise, cleaner air and less polluted rivers and seas, it must realize that the cost of less pollution is other goods and services foregone. Society must order its priorities. Less developed nations would like to enjoy less pollution but are they prepared to pay the cost of less economic growth, starvation, fewer schools and hospitals? What costs are we prepared to pay to enjoy less pollution? The question really is how much pollution do we want, and again the above stated marginal principle must apply.

With any pollution regulation performed in a piecemeal fashion, the danger exists of merely transferring pollution from one form to another. For instance, decreasing air pollution through scrubbing processes in air-polluting industrial processes may mean the creation of the problem of disposing of liquid wastes. That is, less air pollution could imply more water pollution with the waste of scarce resources in making the transformation. To prevent inequities and inefficiencies associated with piecemeal regulation, the marginal principle should still be applied—all the marginal benefits and all the marginal costs must be taken

into account. In noise pollution regulation, fortunately, transferability to other types of pollution is less of a problem, though instances exist of merely moving the noise from one area to another, not always leaving it to an increase in economic efficiency.

For almost all types of pollution, costs rise disproportionately in relation to the degree of nonpollution. Consequently, it is at the margin that decisions must be made. To reduce the noise level from the local freeway, the local community must decide if the real costs; that is, the school or library or any other goods and services foregone, are worth the reduction of noise. The reduction of noise will be the marginal benefit; the alternatives foregone the marginal cost.

If the former exceeds the latter, the project is worthwhile. Unfortunately, with many such projects it is extremely difficult to measure benefits; but unless efforts are made, too little pollution might remain. Examples exist in which freeways have been repaved with smooth surface to cut down noise levels; and the costs have been extremely high and the benefits minimal or negligible. This does not imply that the freeway has not been resurfaced in the most efficient engineering manner; that is, using the least amount of resources. Rather, it suggests that cost-effectiveness in road resurfacing is no substitute for cost-benefit analysis in dealing with the whole problem.

We can use the following framework to analyze this a bit further. While instruments of a sufficient degree of accuracy exist for the measurement of noise, each different degree of noise does not cause the same pain or disability to each individual because different individuals have different reception sensitivity. Also, the noise source or type of noise about the same level of noise, affects different people in different ways. For example, compare a discotheque, a full grand opera chorus, and a jet aircraft takeoff.

For noise levels people do not seek—like the freeways, airports, or whatever—there is general agreement that certain levels of noise are acceptable. For example, using a dbA scale, people seldom complain for noise levels below 70 whereas permanent ear damage can result at a dbA level above 90 for exposure to noise over a protracted period of time. As expected, complaints, legal action, and community activity increase as noise levels increase. What constitutes desirable action to achieve economic efficiency? At this point, I would like to have a figure projected. (Figure 1.)

In this Vu-Graph, the curve *oa* represents the cheapest way to achieve various decreases in noise level. For instance, a decrease of 10 units on the dbA scale can be achieved at costs of S_1 , S_2 , S_3 , and S_4 . If local authorities, for example, decided to decrease noise by 10 dbA's on a freeway passing through a residential area, they would consider not only all reasonable ways to reduce noise by that amount, but also the price tag attached to each. In other words, they would undertake a cost-effectiveness study and consider various alternatives such as reducing speed levels—a 10 mile-per-hour speed decrease yields -3 dbA—construction of a solid wall might be another alternative—a concrete or large

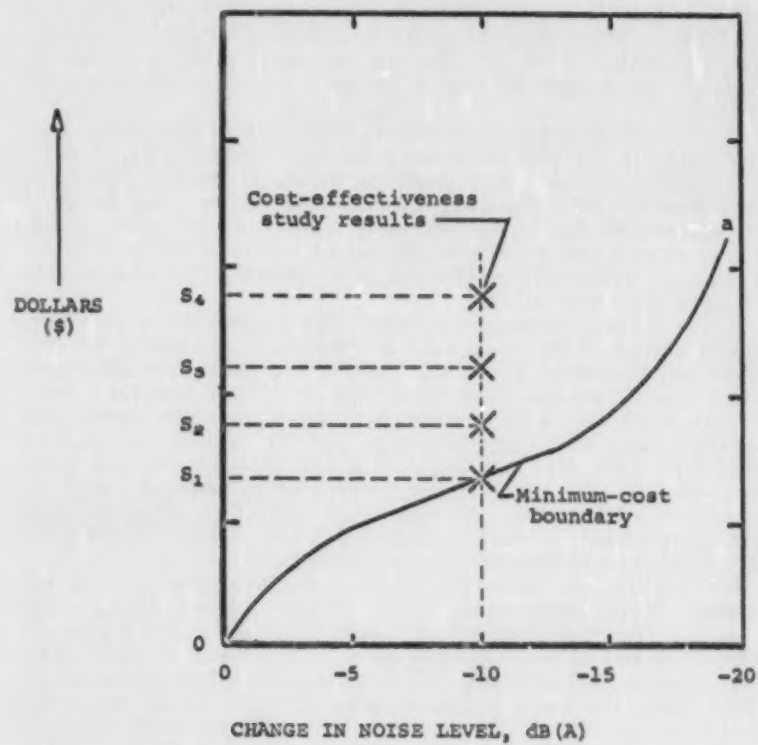


FIGURE 1.- COSTS OF NOISE REDUCTION.

brick wall, 6-foot high yield decreases of about -10 to -15 dbA. Resurfacing the road—going from small chip surface to smooth surface yields -1 dbA—prohibiting motorcycles and diesel trucks might give you -10 to -20 dbA's.

Thus, in this Vu-Graph the area above the line oa is essentially made up of an infinite number of points, each representing a cost relating to different levels of noise reduction. Assuming all costs have been correctly assessed, authorities should concentrate on points on the line oa. This line indicates the most efficient way—that is, the least costly—to achieve any desired level of noise reduction. While such information is necessary for rational decisionmaking, it is not sufficient. I might add that in your above you are really not getting your money's worth.

Cost-benefit analysis is required to discover if the lowest cost associated with some prime level of noise reduced is worth the benefit of that noise reduction. Such an analysis requires consideration of the opportunity cost of noise reduction; that is, what is the community giving up—a hospital, school, better police and fire protection, or less after-tax income to achieve the same level of noise reduction. Thus, whenever the community's demand for noise reduction, perhaps as reflected dollarwise by the size of bond issue imposed by a vote of the people, falls on line oa, the desired level of noise pollution is indicated at the least expense to achieve the level.

There is an additional consideration which most pickets outside polluting factories evidently do not understand. Given that a community decides to decrease some type of pollution, resources are going to be required. If the most effective production process is used to reach the desired level of pollution, costs will be minimized; that is, society will be using the least amount of its resources to achieve the desired pollution level. The question therefore of who pays for the use of these resources is not a question of efficiency but is a question of income distribution.

If airline companies, for example, have to modify jet engines to decrease noise and if they have to bear the initial cost and this is ultimately reflected in higher prices of air travel, passengers' real income will fall. If, on the other hand, Federal taxes are used to modify engines, society at large is bearing the cost to the benefit of airline users. Perhaps a more obvious example is the smoker versus the nonsmoker in a room. If a \$2. widget placed on the end of a cigar stopped cigar smoke pollution, the question of efficiently solving the problem is one of \$2. Should the cigar smoker pay the \$2. or should the person wanting nonpolluted air in the room pay the \$2? In terms of using society's resources the bill is \$2 irrespective of who pays. Who actually pays—it becomes obvious—affects income distribution.

The policy implications of all of the above can be stated as follows: (1) Educate the public to understand how pollution arises, the costs of pollution, and the benefits of pollution. (2) Establish criteria for solving the pollution problem—and this involves marginal analysis, as has been described earlier. (3) Devote resources to the development of measuring tools of pol-

lution since successful legislation will require an ability to identify polluters and degree of pollution if costs are to be assessed against them. (4) Implementation of the aforementioned criteria established in the above necessitates deciding on who should pay to decrease pollution levels, which, by definition, necessitates value judgments.

It must be understood that the presence of pollution in certain instances does not constitute economic inefficiency, and second, even if economic inefficiency does exist, the curing of certain pollution may lead to undesirable income redistribution effects.

For example, if we assume that airport noise is a source of pollution only for those individuals who live close to an airport, it might well be the case that those individuals prefer living in their noisy low-rental houses rather than being forced to look for low-priced housing miles away if the noise pollution were removed from the airport area and housing prices rose concomitantly. In other words, this group of airport dwellers might vote that their world was in equilibrium; the benefits of less noise was not worth the extra cost. Similarly, for people who move to the Los Angeles area for employment, the wage offered presumably takes into account the extra costs incurred by living with smog and noise pollution of that area.

Similarly, in St. Louis, the authorities, in examining air pollution in that area, discovered that automobile emissions were the largest single cause of air pollution, but the citizens showed little enthusiasm for attacking the automobile problem. The authorities decided to concentrate on nonautomobile causes, chiefly industry and specifically iron foundries. For all St. Louis iron foundries, emission reduction of 83.2 percent would require an investment of about \$1 million, and 86.3 percent would require an investment of about \$3 million. This difference of 3.1 percent reduction was hardly measurable but the difference in cost, \$2 million, could mean many foundries going out of business. This example points out the necessity of marginal analysis and also highlights the income redistributional effects, since the cost of the forced shutdown would fall primarily on the unskilled workers in the area. The majority of these workers are black, and such shutdowns could easily reactivate St. Louis' past unemployment and racial problems; that is, impose costs which should be included in initially analyzing the pollution problem.

In some instances, there are situations where these value judgments can be made satisfactorily by designated officials who are legislated to act in compliance with certain established criteria. In other situations, however, a vote of the people concerned might be the most satisfactory method to determine whether a noise-polluted community is in economic equilibrium with other conflicting demands of the populous.

Dr. MEYER. Thank you very much, Mr. Bergrun. I wish to convey the Environmental Protection Agency's appreciation to the California Society of Professional Engineers and to Dr. Lumsden for preparing a most useful and excellent paper on this very difficult subject. Since it deals with certain aspects of economics and government reactions to the sort of problems that

you describe at the end, I would like to start first with Mayor Wise and ask if he has any questions or comments.

Mr. WISE. I wonder if you have any pilot programs going on to see your analysis system work in the city?

Mr. BERGRUN. There are none. I would like to point out, though, that with regard to that Vu-Graph we showed, we can claim a for instance. If you recall that figure there, we are at the low end of the dbA scale, near zero, at -1. We have an expressway or freeway maintained by Santa Clara County out there. It was resurfaced and it must have created a noise differential benefit of maybe 3 dbA, something like that, but the cost would have been high—it would have been an S₃ or an S₅, or something like that. While there is no project, you can take that case as a living example of what we are talking about here.

Mr. WISE. What was the public reaction for that highway?

Mr. BERGRUN. For the people that receive the benefits it was very, very fine. The expressway runs through Los Altos Hills. I happen to be one of those residents there, and we thought it was fine. The kick, though, was that we did not have to pay. That is the way it works.

Mr. WISE. I might say that this further illustrates some of the points you have made. The last hearing I was asked to testify on in Washington was on the Trinity River project in Texas, with very definite environmental aspects. In fact, it has now been held up by a suit, and probably between 75 or 80 percent of the witnesses were taxpayer groups. Say yours is positive. You have got that negative element, if I may use that illustration, of the taxpayer group, which is just about as vociferous and just about as powerful with the government official as are the environmental groups.

Mr. MARTIN. I do not have a question, but I would like to comment a little further on what Mayor Wise has started. At the New York hearings—the New York City code had a perfect political implication—the New York City subways were ruled out for noise reduction because of the cost politically, and for no other reason, because it was a bad feature in Mayor Lindsay's future, you might say.

I think this is one of the greatest reasons that the Congress, in enacting legislation, has to look at preemption, which would force some of these things which would go beyond local political requirements as well as the limit of the local dollars.

Dr. BERANEK. It seems to me that some of the implications of what Professor Lumsden has written here and you have brought to us bear directly from the mission of EPA. One of the important points that you have brought out is the policy implications of what you have said, and that embodied four subpoints; namely, educate the public to understand how pollution arises and the costs and the benefits of getting rid of pollution; two, establish a criteria for solving the pollution problem; three, devote resources to the development of tools for measuring the pollution, so you can enforce anything or know your base line are starting from and where you are getting to in the future, and then the implementation of any criteria or legislation that is established. Then you go on to point out that the value judg-

ments have to be made by the designated officials who are in the legislation, either national or regional, and maybe it needs a vote of the people as a whole.

This costs money, and you have got to recognize this. If EPA is to respond to the noise pollution problem in the way that you have outlined here, some budgeting will be necessary to develop these different areas, and then to feed that information into the legislative bodies, both national and regional, to permit them to make intelligent decisions or to bring the story to the people, so that people can decide by popular vote whether or not they want to do this.

Looking into this, I have had some experience in several of these programs, through a procedure that has been called technology assessment, where, at quite a high cost, with a good deal of study, perhaps a year's study involving maybe an interdisciplinary group that is put together for that purpose only, and maybe involving only a dozen people for this year's time—aside from health, the Secretary and so on—it would be necessary to look at one problem, such as what do you do about the National Airport noise situation. If you look at the cost of that, this is quite large. Then if you could put on top of that the cost of educating the legislature—some people have got to go and report this to them and convey this report to them in some way, get them to listen, so that they are intelligent enough to make this decision—and I think budgets are required.

In addition, you have got to develop the tools, what they are, and measuring techniques, and get those instruments disseminated throughout the Nation, and make available noise control techniques, which also have to be developed at government expense. One of the things that it does suggest is that many of these noise pollution things have to be done on a national level. No State or town can really afford to do much of this by comparison to what it is going to take to do it right.

Mr. BERGRUN. Certainly there do have to be broad rules established at the national level for all States to live by. There is no way around that, and localities cannot do a lot of this themselves. Guidelines will certainly have to be provided. In our community, we have an ordinance that states if you have anything that goes above a designated decibel level that is designated in the ordinance, you are in violation to the tune of \$500 and maybe 6 months in jail.

To give you an idea of how that works, one Sunday afternoon a chain saw was operated 200 feet away, and I was sure it would not hit anything above 110 decibel or so. I tried to get hold of a noise meter to measure this, and I did not get one fast enough. There is only one that I know of in the community, but I could not enforce that provision of the law at all unless I had something to measure it with. So these instruments are going to have to be provided, and people are going to have to be instructed in their use if we are going to have this ordinance effective. It goes right across the board.

Mr. BERLAND. I was glad to hear you speak on your noise in Los Altos because I understand from the citizens' point of view,

it is perhaps the best ordinance, in terms of its limit, in the country. But you did point out the problem of enforcement. I guess Los Altos is going to have to work out something.

Getting back to Professor Lumsden's paper which you have presented, I do not ask you to defend it but I find his point of view absolutely refreshing because it is such a caveat emptor expression of "let the buyer be damned. Let the public be damned." It is interesting that he puts the entire cost of the burden of cleaning up pollution on the public. He states in here that it is up to the factory to decide what is economically feasible, as to whether it ought to put its pollution into the river or not, ergo it is up to the airlines to decide whether they are noisy. I find it sort of incredible.

I do not understand his economic reasoning and I do not ask you to justify it, but it seems to me that if it is cheaper to produce an airplane that is noisy, it may be a saving on the part of the airline but it certainly is not cheaper in terms of the public's cost, hearing, sleep deprivation, et cetera. It always comes back to the public having to pay. If you clean up the engines, he suggests the public is going to have to pay taxes to make those engines cleaner and quieter; yet I think that good people who are engineers might at the beginning design in such cleanliness and quiet.

Mr. BERGRUN. I think that is what engineers like to do over a period of time.

Mr. BERLAND. There is also an assumption in here which I consider quite false, where he gives a comparison of people moving into Los Angeles and they have to trade off the noise and the smog since they are going to live close to the airport for the opportunity of having jobs. We have another example where you have to trade off the noise of the factor, otherwise we will get into racial disorders. I think it is a false assumption because I know of situations, I know myself, personally, that it is not so much that the people are moving into the polluted environment as the environment around them becoming increasingly more polluted, and to them, as long as they sit there in their homes and have to breathe this air and hear this noise, the cost is increasing in terms of their health, their sanity, and their quality of living. Yes, it may be cheaper to make a noisy lawnmower or whatever appliance, cheaper to the person who produces it, but it certainly is not cheaper to the person who is hearing it.

Mr. WISE. Complicating the economic—the public aspect even further, Dallas, for example—I am going to say this with some considerable civic pride here; is now getting businesses from other areas of the country, I am speaking of industry, which means jobs, which means a decreased tax base, which means it benefits the individual, all over the country, not particularly Los Angeles and New York City. Here is where lack of pollution—or a good pollution situation that is less pollution than other cities in the country—is benefiting the community, not only in terms of lower tax rates, more jobs, et cetera, but also a better overall standing of living for everybody concerned, so here again we come to a turnaround sort of benefit to the individual.

'Then the question, of course, is as the industry comes in, are they then going to ruin the atmosphere? And in many cases they will, unless it is carefully controlled.

Mr. BERGRUN. Yes, It has to be kept in balance.

Dr. MEYER. I think both of these comments are very important to the record. As Mr. Berland has pointed out, one of the real problems that those of us concerned with all aspects of the environment have to deal with is that in many cases the worst impacted individuals were there before the industry was there or became such a problem. Certainly, in our hearings at Atlanta, in Dallas, and other cities, this point has been brought out with regard to aircraft noise and the encroachment of noise into those areas.

Dr. JOHNSON. I found the paper rather frustrating. About 100 questions were asked and there was only one answer, and that is to use the marginal analysis. I recognize, of course, that it is not that easy. The question I would like to ask you is, can you choose one example which would demonstrate who should make a decision? Let us use the example of killing fish. Let us assume there are eight kinds of fish in the river, and after this company started discharging into the river it has reduced the number of kinds of fish to seven, from eight, sufficient to catch. Who should make the judgment of what the cost of that should be? How do they evaluate the cost of reducing the number of fish life by one, from eight to seven?

Mr. BERGRUN. Well, if you choose the San Francisco Bay, where you bring in thousands of fish a day and it has a certain market value, you begin to get a handle on it, but if you have only one out of a small number, the answer is that you could not do it.

Dr. JOHNSON. In the paper here, they use the example of fish in the river.

Mr. BERGRUN. There, you have to assume it has fishery value, and by the market process you have a way to evaluate this, if you are not just talking about seven or eight fish.

Dr. JOHNSON. Then you are at a loss, as I see it, when you are not dealing with life and death. Here the quality of life means nothing. The reason I bring this up is because that is the very position in which we find ourselves. Very few deaths are caused by noise. It is a quality of life. When you are dealing with life and death, it is easier to make a decision than when you are arguing on the quality of life.

Mr. BERGRUN. I think these are difficult decisions. It may not be a fact of all of them. You may be able to quantify them, to some degree.

Dr. JOHNSON. Who wants to quantify them? Do you suggest that the people make decisions?

Mr. BERGRUN. Somehow you have to get some data that you say is an index. That is the best answer I can give you. I can cite an example with the airplanes. We have pilot opinion about how you fly airplanes. It is just opinion. You get some indices, A, B, C and D, and you can come surprisingly close to getting a pretty good index of what is good flying control. I think one should try to get some sort of indices involved.

Dr. MEYER. I think this highlights one of the real problems in dealing with noise. In the main, we are dealing with something that is an environmental quality problem. Going back to the previous witnesses, the paper also points out that a society, such as the one you are vice president of, assists along with sister societies in helping to better qualify these measures. It seems to me this whole paper highlights the difficulties of economic analysis associated with what amounts to intangible values once one gets below the threshold of actual physiological damage. Ken, do you have any questions?

Mr. ELDRED. I would like to make a comment along that same line. It seems to me the quality aspect here is extraordinarily difficult to qualify on a general basis. That breaks down some of the marginal analysis approach, which is very good when you are looking at the performance trade off's because there you have numbers; so that one approach to this is the public must resolve for itself what it deems to be an acceptable quality of life.

This now becomes a performance requirement which the engineer can deal with as far as trying to design a machine to meet this new requirement, along with the other performance attributes of this machine. One of the things that is not in here is the concept of time. It comes to: What can you do today in trade off's? The DC-10 airplanes is like 15 decibels quieter than its predecessor 15 years ago, and that is probably at very little cost and it is a much more efficient airplane. This is one of the major areas where some of these problems will really be solved, but that does not show up in this marginal analysis.

Mr. BERGRUN. It was recognized that this was treated as a study at the time. You are quite correct that over a period of time, that is when you can really gain these benefits at a very cheap cost.

That instance I gave you—the freeway—the expressway—rather than just taking 1 db for I do not know what the cost, they said:

We will just cut down the speed for the next six months or so by 10 miles an hour, and that will get us off the hook for a while. And we are going to do something else and work it in.

When it came, we all saw that thing in Santa Clara County. That is the redistribution of income. But these things can be programed over a period of time.

Dr. MEYER. Thank you very much for a very important paper. It is one that we are going to study quite carefully. At this point, I would like to take what we euphemistically term a 5-minute ecology break.

(Recess.)

Dr. MEYER. At this point, I would like to call Mr. Michael Berger, who is an attorney from Los Angeles, Calif. We have heard an interesting discussion on economics and some of the difficulties associated with trying to figure out costs. The next witness will describe an attribute of that difficult problem which will be of considerable interest to the panel. Therefore, Mr. Berger, I look forward to what you have to say. We have heard some of your comments in San Francisco, and I believe they

will be most important to bring out at this hearing also, so please proceed, sir.

**STATEMENT OF MICHAEL M. BARGER, ATTORNEY
FADEM & TANNER, LOS ANGELES, CALIF.**

Mr. BERGER. Mr. Chairman, members of the panel, I am very happy to be back again to pursue much of the same topic but perhaps in a different way than we did in San Francisco. As indicated, I am a practicing attorney in Los Angeles. My focus on this issue, I suppose, is that I spend most of my time representing property owners in eminent domain litigation, including litigation involving jet noise. I also serve on the American Bar Committee on the Law of Noise.

I would like to talk today about the Federal Aviation Administration, or, more precisely, if I can use the vernacular of a couple of years ago, some of the games the FAA plays.

The FAA has successfully been playing games with the Federal courts and the millions of citizens around the Nation who are adversely affected by airport noise. The games have as their object the achievement of the ultimate in bureaucratic buck-passing—do whatever is necessary to avoid facing the problem.

Game No. 1 approaches, if not breaches, the borders of unethical legal practice. It is simplicity itself. When the FAA is sued in a U.S. district court outside of Washington, D.C., the FAA tells the U.S. district court that jurisdiction resides solely in the U.S. district court in Washington, D.C. When someone sues the FAA about airport noise in the U.S. district court in Washington, D.C., the FAA tells the U.S. district court in Washington, D.C., that jurisdiction rests with the U.S. district court in which the airport is located.

Game No. 2 is when a citizen makes a formal complaint for an administrative hearing before the FAA to control the unendurable noise around jet airports, the FAA formally and officially declares that control of airport noise is wholly a local concern of the operator of the airport. But when an aroused citizen sues the operator of the local airport or an aroused neighboring municipality enacts legislation to reach the problem, the FAA comes before the court and says the control of airport noise is solely and exclusively within the jurisdiction of the FAA.

One might find this difficult to believe if it were not for the ample documentation. For example, game No. 1, ploy No. 1 are as follows: A good place to start is in *Alfonso v. Hillsborough County Aviation Authority*. The FAA successfully moved to quash service of summons on the ground that the suit was brought in Florida, and service on the Administrator in Washington, D.C., was thus ineffective. For years, a bitter dispute has raged between the city of New Haven, Conn., and the neighboring town of East Haven. In *Town of East Haven v. Eastern Airlines, Inc.*, the FAA successfully moved to dismiss on behalf of the Administrator on the same ground.

But there is no need to take my word on this maneuvering. As Judge Timbers caustically noted in the New Haven airport case:

"Although the court's hands are tied as far as providing the relief here demanded against the Administrator, the court would be derelict if it failed to comment on the conduct of the Administrator during the pendency of this action. If plaintiffs' claims were not known to the Administrator prior to the institution of this suit, they surely have been made known to him by now, at least in a general way. Yet the Administrator has refused to extend an invitation to these people to sit down with him so that he may hear them out. The Administrator is charged with serving the "public interest." The people who live near expanding airports in this jet age are no less a part of the public than those who fly in the planes. The Court expresses no opinion as to the merits of plaintiffs' claims; but it does believe it is within the court's competence to comment on the Administrator's apparent desire to avoid the issue rather than to take the initiative and meet it head on.

Game No. 1, ploy No. 2: In the case of *Brand v. Shaffer*, a case currently going on in Massachusetts, the plaintiffs finally learned the lesson. Although the problem concerned an airport in Massachusetts, suit was brought in the District of Columbia so that the court would have jurisdiction over the Administrator. The FAA, however, then successfully moved to change venue to Massachusetts.

Just recently, it has become even more apparent that the FAA has not run out of ploys to avoid the problem. Remember the dispute between New Haven and East Haven over development of the New Haven Airport? Remember how the FAA Administrator had himself dismissed from the Federal court action? Later on, the parties repaired to the State courts where, after trial on the merits and appeal, the Connecticut Supreme Court ordered New Haven (pursuant to State law) to cease expansion of its airport into or over East Haven without the approval of East Haven. This would appear to be the embodiment of the local control which the FAA professes to embrace. The FAA's reaction, however, was less than enthusiastic.

In the original Federal litigation between these two municipalities, the FAA Administrator successfully moved to dismiss (thereby drawing the ire of the trial judge), and not only washed his hands of the controversy but deprived himself and his agency of a proper forum in which to present their views. Then, when the other parties had spent their time, effort and fortunes litigating all the way through the Connecticut Supreme Court, the FAA decided that it did not like the result and initiated its own independent action to undo all that had gone before.

Recalling that the FAA obtained a dismissal from the litigation on the ground that it was brought in Connecticut rather than in the District of Columbia, where did the FAA bring its suit? In the District of Columbia? Certainly not. In the U.S. District Court for the District of Connecticut. In commenting on these actions, one could hardly do better than repeat the words of Judge Timbers, uttered in the original U.S. district court litigation:

The Administrator is charged with serving the "public interest." The people who live near expanding airports in this jet age are no less a part of the public than those who fly in the planes.

It may just be that the public interest is something less than uppermost in the FAA's thoughts. For some reason, Commodore Vanderbilt's notorious aphorism, "the public be damned" comes readily to mind.

Game No. 2, ploy No. 1: There are two facets to this ploy. The first deals with the enactment of regulations by the FAA governing the certification of aircraft. The second, with the FAA's attitude toward requests to regulate noise at individual airports.

Our starting point has got to be 49 U.S.C. 1431, where Congress gave the FAA the power to establish noise certification standards for jet aircraft in order "to afford present and future relief and protection to the public from unnecessary aircraft noise * * *."

The statute is clear. But the FAA has yet to issue regulations which provide any relief to the suffering citizenry. The noisy jets that caused the problem are unaffected by any noise regulations currently in effect.

The stock FAA explanation for the failure of its noise standard to prescribe a livable level of noise goes something like this, and I quote from their comments that went along with their Federal standard:

It should be emphasized that nothing in this amendment is intended to substitute Federal judgment for that of the airport proprietor in the determination of the noise levels, noise measurement or noise evaluation techniques that are most responsive to the particular and unique problems facing each airport proprietor.

In other words, the FAA's view of its role is to set a standard—presumably, any standard. Then, it is up to the local authorities to so adjust their land use patterns that noise created under the FAA's standard will not create any damage.

If that sounds fanciful, consider the recent statement by an FAA attorney in an American Bar Association publication:

Thus, the distinction between Federal definition of source noise reduction limits and non-Federal definition of airport noise compatibility requirements is consistently preserved in part 36. * * * While the aircraft is found to conform to standards that are as restrictive as technology allows, such "approval" is neither a statement, nor a prediction, that a given community/runway situation is or should be compatible with operation of that aircraft.

But remembering the FAA's statutory command, "to afford present and future relief and protection to the public from unnecessary aircraft noise," the FAA's position sounds a bit hollow. In spite of its clear mandate, it insists that only local airport operators can make noise abatement effective. As the FAA has noted on many occasions, "in order to make their airports fit the particular needs of their locales * * * airport operators acting as proprietors can presently deny the use of their airports to aircraft on the basis of noise considerations so long as such exclusion is nondiscriminatory."

That brings us to the second facet of this ploy: the FAA's response to local requests for help. In 1969, a Santa Monica resident applied to the FAA for them to prescribe noise regulations for the Santa Monica, Calif., Municipal Airport. The FAA refused, on the ground that this was a matter of local concern.

The FAA made the same response to the county counsel of Orange County, Calif.

So, in order to solve the noise problem, all an airport operator need do is ban jets, or limit jets, or put a curfew on jets. And according to the FAA, he has the authority to do any of these. Almost.

Game No. 2, ploy No. 2: You see, when the Federal Government (through the FAA) grants funds to local airport operators, it enters into contracts with them called grant agreements. And in these grant agreements the FAA routinely takes away by contract the power to deny the use of an airport to noisy aircraft.

For example, in San Diego, Calif., the board of airport commissioners wanted to impose a curfew in order to cut down on the nuisance inflicted on the neighboring property owners. Immediately upon publication of the commissioners' request, the Federal Aviation Administration informed them that any such restrictions would violate their commitments under their Federal Aid to Airports grant agreements, which required them to operate the airport without restriction as to hours. After many discussions with FAA officials, it was determined that the proposed regulation should not be implemented.

Another example is at Santa Monica, Calif., where the municipal airport caters only to general aviation, has literally no buffer between it and the surrounding residences and, when the executive jets operate, is probably the noisiest airport in the world. Nearby homes are subjected to noise ranging higher than 120 PNdb. In addition, the airport is probably not the most economical use for the city to make of the property and the city fathers have recently considered shutting it down. Before they could so much as pass a resolution, the FAA steps into the act:

We have been informed that the city of Santa Monica is considering alternative uses of the property presently used for the Santa Monica Airport. I respectfully suggest, at the outset, that retention of the Santa Monica Airport in our transportation system requires consideration of many factors other than direct economic returns, not the least of which is the fact that air transportation in southern California is highly dependent upon the continued operation by multiple municipalities of all the existing airports serving our complex community. This is as true for Santa Monica as it is for the continued operation of Los Angeles International Airport.

I am reading from a letter from Arvin O. Basnight, FAA Western Regional Director, to Anthony Dituri, mayor of Santa Monica, Calif., June 16, 1971.

The Federal Aviation Administration has no intention of consenting to the use of this property for other than airport purposes and will insist on the city of Santa Monica complying with its contractual obligations to the Government. To do otherwise would seriously impair the national air transportation system and particularly would be detrimental to the residents of all of southern California who are dependent in one way or another upon air transportation.

So, the FAA strictly enforces its contracts with local airport operators. In fact, so strongly that all of the local control and responsibility that the FAA is fond of exhibiting turns out to be highly ephemeral.

But that may not be all bad. Perhaps this cloud has a silver lining. There are requirements in those grant agreements—requirements put there by statute—that airport operators must consider their neighbors.

One such statute reads:

No airport project development may be approved by the Secretary unless he is satisfied that fair consideration has been given to the interest of communities in or near which such project may be located.

Another statute reads:

As a condition precedent to his approval of an airport development project under this subchapter, the Secretary shall receive assurances in writing, satisfactory to him, that * * * appropriate action, including the adoption of zoning laws, has been or will be taken, to the extent reasonable, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and take-off of aircraft.

Surely, if the FAA is strictly enforcing its contracts, strict enforcement of these provisions will bring some measure of relief to suffering thousands. Indeed, in a recent case in East Haven, the Federal judge referred to them as mere boilerplate, not worthy to be brought to court. Unfortunately, there is nothing to lead us to believe that the FAA has given any thought to these provisions.

We seem to have come full circle. The FAA says it has little power, that the operators must act in order to have any relief from noise pollution. Yet when the operators attempt to act, the FAA throws in a veto, exercising power whose existence it denies.

The FAA's appearance in court, in suits related to noise abatement, is fascinating. Remember the FAA's plaint in enacting certification standards? The FAA did not have sufficient authority to solve the jet noise problem; it needed help from local authorities, because Congress did not intend for the Federal Government to substitute its wisdom for that of the people most concerned.

In court, however, the FAA has firmly held to the position that Congress preempted the field for the FAA to coordinate. This posture does not aid in abating aircraft noise; it ensures its perpetuation.

Perhaps the FAA's position was best summed up in the amicus curiae brief it filed in *Lockheed Air Terminal, Inc. v. City of Burbank*. In that case, the city of Burbank, Calif., in order to protect its citizens from the increasing noise hazard being created by the Hollywood-Burbank Airport, enacted a curfew from 11 p.m. to 7 a.m. The FAA appeared as a friend of those opposing the ordinance. Relying on the Federal Aviation Act of 1958, the 1968 amendment to that act (which authorized the FAA to set noise levels for certification), the regulations which the FAA has made, and the Airport and Airway Development Act of 1970, the FAA concluded that: "The Federal scheme is comprehensive and pervasive," and that the entire field has been, "preempted by Congress."

To be sure, the FAA found one minor chink in the preemption picture: The airport operator—as operator—may make certain regulations. (Of course, as we discussed earlier, this is apparently only a theoretical chink, as the FAA vigorously fights any such attempts.) But the FAA apparently does not even like this theoretical diminution of its authority (contrary to its public statements discussed earlier).

The California Court of Appeal recently decided the case of *Stagg v. Municipal Court*. In that case, taking the FAA at its word, the court held that Santa Monica, as owner and operator of the airport, could impose a curfew on jet flights. The FAA

has apparently had a recent change of heart. In the Burbank Airport case, it told the court that:

The important 1968 amendment to the Federal Aviation Act appears not to have been considered by the court which upheld a jet curfew at the Santa Monica Municipal Airport * * *. The *Stagg* case was commenced in January 1968 before the amendment was enacted, and although the appellate decision was rendered after the amendment became law, perhaps the failure to consider the amendment was a consequence of the fact that there was no appearance in the appellate court by the party challenging the curfew. Moreover, the court in *Stagg* had no opportunity to consider the further preemption resulting from the 1970 Airport and Airway Development Act.

First, in order to set the record straight, while the *Stagg* opinion does not refer to the 1968 amendment, that legislation was considered. In fact, it was brought to the court's attention by the airport operation, and it was before the court.

But there are two important messages in the FAA's brief: (1) The FAA now feels that no one but the FAA may regulate in the field of aircraft noise. (2) The FAA—and probably more important—is playing unfortunate games with the public interest: either it has all pervasive power, as it represented to the court in the *Burbank Airport* case—or it has limited power, as it represented to the public when issuing noise standards for certification. It cannot have things both ways. The FAA's schizoid stand serves no one but the airline industry.

The FAA has taken the same position in attacking local ordinances regulating the permissible level of noise. The best-known case is *American Airlines v. Town of Hempstead*, where the FAA intervened and convinced the district court that it had preempted the field. The court of appeals affirmed the injunction against the ordinance without reaching the preemption issue.

The latest chapter in this instance is a lawsuit filed by the FAA (previously it had merely intervened or appeared as *amicus curiae* in suits filed by others) against the city of Inglewood, Calif. Inglewood's ordinance limits aircraft noise to 90 db, but it exempts aircraft which are either in emergency situations or which are operating in conformity with federal laws or regulations.

The law suit came about because the city of Inglewood sighted one aircraft flying far lower than allowed in the regulations. The FAA, in seeking to enjoin enforcement of the ordinance, takes the position that only the FAA is competent to interpret and apply Federal laws and regulations. The case is set for trial in December.

In summary, the FAA has adopted whatever ploy appeared necessary to prevent the enforcement of meaningful noise standards. In so doing, it has exhibited a facility for broken field running which would be much coveted by many professional football players. It has steadfastly taken positions which point in all possible directions and, in the end result, it is the American people who continue to suffer.

Without minimizing the importance of air transport, those who fly must not be permitted to do so at the expense of those who live, work or own property near airports. There are mitigations that can be accomplished by changed methods of operation. In some cases they involve penalties. But those are minor com-

pared to what will happen if every effort is not made by manufacturer, operator and airport. The air-travel industry will have its development drastically curtailed if it does not produce every bit of relief possible.

Government at the administrative level has abdicated. There has been no step taken by the Federal Government that has provided one decibel of relief. The new regulations will not bring relief, if at all, for a decade. If one wants to see the epitomization of stalling, buckpassing and bureaucratic obeisance of regulators to those they are supposed to regulate, here is a case in point.

Our system of government provides checks and balances which have slowly begun to work. The demise of the SST, of the fourth New York airport, and of the Everglades Airport are an example of this "win a battle—lose a battle" technique, which results in a spotty program, and if the FAA does not face up to reality, it will not even be serving the airlines well.

Dr. MEYER. Thank you very much for bringing this matter into such sharp focus. I would like to ask Mr. Eldred if he would like to start off with any questions or comments.

Mr. ELDRED. I thought that was a most entertaining and informative exposition on this kind of complex legal issue. Not being a lawyer, I will not try to comment on the legal aspects. I would say one thing: The FAA certification is, in fact, producing quieter airplanes as a result of pressure, which eventually will be developed. My question to you is, What do you feel the EPA role should be in this area, where you say the FAA is abdicating its responsibilities, and what sort of power should the EPA have so that it can effectively play the role which it will have?

Mr. BERGER. I have felt all along, since the 1968 legislation, which gave the power to the FAA to certify aircraft noise standards, that that power had been given to the wrong agency. The FAA is supposed to promote air transport and at the same time protect the neighbors of the airport. It is a very difficult thing for the FAA to reconcile, and I think they have done a bad job of trying to reconcile it.

As presently constituted, I am not absolutely clear how much power EPA has. I gather it is not a whole lot in this field. The FAA is still the primary one with that responsibility. My hope would be that that responsibility would be transferred to EPA, to an organization which can look solely at the protection and without having to try to balance that off against the promotion of aviation. We have an agency which is doing that right now, and doing a rather good job of it. I think they are doing that at the expense of this issue.

As an example of that, the statute that they operate under, the 1968 amendment, says that the certification standards are supposed to be economically reasonable. That has been interpreted by the FAA to mean economically reasonable to the aviation industry. That is not what the statute says, and I found it most interesting to compare that statutory language with the last witness we had here.

When we are talking about economics, somebody always pays

the cost. When we have got a system that forces those costs on innocent bystanders who have nothing to do with the activity, then it is not economically reasonable. I believe that the FAA has been wrong in its interpretation that way, and it has got to be given to an agency which can get away from the aviation industry.

Dr. JOHNSON. You made a very strong statement. You said: "The FAA's schizoid stand serves no one but the airline industry." My question to you is this: Is it really true that the FAA has not done anything to improve the noise control for the benefit of the citizens?

Mr. BERGER. I firmly believe that they have done as little as they could possibly get away with, and as a result there is virtually no relief, as was stated before. There is going to be some relief eventually. There is a new generation of aircraft coming into being which are somewhat quieter than the old ones. They are not, by a long shot, as quiet as they ought to be from a neighboring homeowner's point of view. They are quieter. The point is, we still have the air traffic in service which are the ones which originally caused the problem. They have not gone away and they are not about to be phased out for many years, from an economic standpoint.

Dr. JOHNSON. Quite often, city planners have put the airport in a remote location, only to find itself within 5 years to be completely surrounded by a new community.

Mr. BERGER. That does happen.

Dr. JOHNSON. That is not FAA responsibility. I am asking, is there also someone else? Does someone have responsibility for that?

Mr. BERGER. Certainly. There is no question but that the city planners are to be greatly faulted for some of the things that they have done. I wrote on that subject a couple of years ago and I did not have very many kind things to say about them. There are various kinds of arms. The city planner and the local government do not talk to each other. We have an arm that says we are going to have an airport; another arm that says we are going to have a residential development in this area, and without talking to each other they go ahead and "plan" this way. Some kind of coordination has got to come.

Mr. JOHNSON. What you are saying is that this is not likely to happen unless they are governed also by someone from an even further perspective. Municipalities are not likely to do this by themselves at all unless someone does it for them.

Mr. BERGER. I would hope that the municipalities would see that their own self-interest lies in coordinating their own planning activities. All that happens is that it is the same municipal government, merely different branches of it, that are not talking to each other and do not know what the other is doing.

There are other problems where you have multiple municipalities surrounding the airport. We have got one of those in Los Angeles, God knows, and that is one of our great problems. The Los Angeles International Airport is almost completely surrounded by other communities.

Dr. JOHNSON. I have one last question. You indicated that this is primarily a lawyer game. Is there anything that can be done to sanitize the legal profession such that this will not happen?

Mr. BERGER. I sure hope so. I would like to think so, but it is really tough. It is a hard thing to get them to do. I think that they have been playing unfortunate legal games with this. It seems to me that we ought to deal with these problems on the merits instead of playing these silly procedural games and running back and forth from one court to the next, telling everybody that nobody has got jurisdiction, which leaves me in a state of spluttering, practically.

Dr. JOHNSON. Is there not something that can be done from the legal point of view? I am really serious.

Mr. BERGER. I am serious too. We have ethics. We have been revising them recently. There is a new one which I know we have been trying to get some publicity for—our law firm, which deals with the responsibilities of government lawyers. It is the duty of government lawyers to try to seek a fair result and not play it like they were representing private people and they had only the interest of their client at heart. Everybody is the client of a government lawyer, and they have got to be brought to view it in that way. Sometimes they get entrenched in departments and fight it a little too close—there is a problem there. We are trying to deal with it, but I am not sure how successful.

Mr. ELDRED. Would not that tie the hand of a government lawyer behind his back when he has an adversary?

Mr. BERGER. In some cases we are going to have to tie the government lawyer with one hand behind his back. He is in a completely different position than a private lawyer. He does not represent a private person with an ax to grind. He is representing the government, whose duty it is to help everybody.

Mr. BERLAND. We experienced some of the same frustration in Chicago that you have experienced in California with the three airports. We have a situation of the fine firm of Bolt, Beranek & Newman a year ago coming in with a report to the city of Chicago, and in their report advising that O'Hare International Airport and Midway, which were owned by the city of Chicago, were, in fact, special instances of commercial and industrial zoning. We have a little difficulty in getting the government of the city of Chicago to believe their own consultants. However, you do not have that same problem in the city as to where there is a very stringent requirement as to how jet aircraft shall land. However, I think that some of these jets did land under the minimum, as they do over my home every day, even at 1:30 at night. We might have more speed, in terms of legislation, to give us some relief from the noise of the aircraft.

I do not think we should isolate those people who make the laws. They should be given the same circumstances as the rest of us.

Mr. BERGER. I believe it was Congressman Pucinsky who suggested that sonic boom tests be conducted over the Capitol rather than out in the hinterland, so that the legislative leaders could find out what it was like to be subjected to it.

Mr. BERLAND. We are trying to get some abatement of noise, but it is apparently very frustrating, as you point out. One area you have not addressed yourself to is the whole subject of military aircraft. I do not know why, or for what reason. Again, it is under the guise of security, military aircraft and military airports. Near Chicago, we have got Winfield Naval Air Station, and we have a situation of military aircraft making as much, if not more, noise than civilian aircraft. And again, there has to be some sort of relief for the citizenry of such noise. I am sure there are legal problems with that.

Mr. BERGER. There is no question. The landmark cases that we have got, the first case to reach the U.S. Supreme Court dealt with military aircraft—many of the big cases also. They are a very special problem. I think you run into all kinds of problems trying to put mufflers on military jets and cutting down on their power.

Mr. BERLAND. Would you agree that we perhaps need some sort of legislation, have some sort of enabling legislation that will allow for a local regulation of aircraft to cut through, as you have so well pointed out, all the games that the FAA plays? Do you think that is a place where there might be some relief for noise from aircraft?

Mr. BERGER. It is a very difficult question, obviously. The whole issue of whether the Federal Government has preempted regulation of aircraft noise is a very knotty one. The Federal Aviation Act itself contains a clause which says that it does not preempt the localities from reacting. This clause is routinely ignored by the courts. People do not pay any attention to that. We do not need enabling legislation. We have legislation on the books that specifically says the localities can act. The FAA, as I pointed out, is fond of saying that the local municipalities are the only ones that can act. As long as we have that kind of Federal leadership, we have got to allow the local municipalities to take some action to get rid of the noise nuisance that they feel they cannot live with any longer.

Mr. BERLAND. I have before me a news release put out by NASA, September 17, 1971, in which they talk about a program that NASA Ames Research Center has been conducting with American Airlines in terms of the operation of aircraft to reduce noise. I do not know where NASA is involved, but from what you say this is just so much paper and it is not going to have any effect on the FAA. You have the situation of not just localities but the Federal Government agencies not talking or listening to each other.

Mr. BERGER. There are certainly a large number of Federal agencies doing some sort of work. Perhaps some of the gentlemen on the panel are more familiar with their work than I am. I am not familiar with what NASA is doing.

Mr. MARTIN. The work that was done with American Airlines was to come up with new methods of reducing the amount of exposure around airports; in other words, by different flight patterns or approaches, bringing in the noise impact area and reducing the exposure of people further out. American plans to pursue this further, as to other airlines. In fact, in Minneapolis

some of the airlines have already put in two-segment approach patterns, which has done just this. NASA gets into this because people forget it is not aerospace but it is aeronautical. Their original responsibility dealt with the aircraft industry, so they do get into research and work in this area of augment work on other government agencies.

Dr. MEYER. The Chair will point out that there will be an opportunity for the panel to discuss this matter with a representative of American Airlines tomorrow afternoon; the vice president in charge of engineering operations, Mr. Kolk, will be here.

Mr. WISE. I find myself in the uncomfortable position of having to agree with the witness' criticism of municipalities. One of the faults has been, down through the years, that the planning and zoning commissions have been largely made up of people whose overriding interest is business, real estate, industry, and so forth. I think, however, there is a backlash trend toward more citizen-oriented representation on these advisory boards. At least in my own city I would like to think that is so.

I do not want to make an excuse for the obvious faults which you point out and with which I agree. However, I do think it is only fair to point out also that the age of aviation came on at such a tremendous rate that even the finest planner—and we have had some very poor planners—could not have really projected or anticipated the age of jet aircraft and the noise situation with which we are now faced. The ones we plan today are better. They have to plan not in terms of the DC-10, which is less noisy, but in terms of the possibility of noisier aircraft in the future, in making such projections. They cannot be all-seeing or all-knowing, and I do not think they were some 15 or 20 years ago when so many airports were being built.

One more thing, some of the innocent bystanders to whom you refer are not really innocent bystanders. For example, in Dallas Love Field, which is right in the middle of the city, I myself moved into an apartment, back before my politician days, that was right on the runway at Love Field, and did not mind it at all. The apartments at Love Field over which the aircraft fly are constantly full, for one reason or another—full with hostesses, full with aircraft pilots, full with people who like to be close to Love Field because of their businesses, et cetera, so some of these innocent bystanders are people who choose to live close to airports, to whom perhaps the noise abatement is not an issue as it is with us here today.

Mr. BERGER. There is no question that there is a lot of residential occupancy near airports and it is made up, to a large extent, of people whose work is connected with the airport. There are, however, as you are obviously well aware, numerous others who found themselves swamped by the airport, by the jet age. They could not predict it any better than the city planners, and all of a sudden the jets burst on them full-blown and their peaceful neighborhoods were gone.

Mr. WISE. Absolutely, and those are the ones we have to be concerned with.

Dr. BERANEK. To illustrate that somebody has to take overall responsibility, on behalf of the Government, for aircraft noise eventually, this very well could be EPA. I am not advocating that; I do not know the best way to solve the problem. I am going to indicate a passive problem which you did not address yourself to.

As you well know, the FAA has a regulation now which deals with new aircraft, and these new aircraft have to be quieter than those of a generation of aircraft ago. As the mayor said, the CD-10 is one example; the Lockheed 10-11 and other planes are other examples of this new generation. Although we are not as soon to have an SST in this country, there are one or two being cooked up in Europe. These new aircraft will enter our airports, therefore should they come under this new FAA regulation? At first glance, the answer is yes, because they have to be certified for safety and noise if they are going to use our airports. The difficulty is that the State Department has entered into international agreements which say the certification of airplanes for safety and noise can be done by other nations if the United States has agreed that they have a technical competency to do this. France and England have fallen into that category, and it is possible that Russia does too, though I do not know.

We are faced with the fact that a plane may be able to come in and invade our noise rules simply because another nation has the right to certify it.

Now, the people who own the airports, can they stop these noisy planes from coming in, assuming they will be noisier than the new rules require? What is going to happen at this point?

Mr. BERGER. It is an interesting problem and I think on two levels. First, the individual operators have the power to keep them out. I do not think any individual airport operator has to allow any kind of plane from any country to land at its airport if it does not want that kind of service. I am not sure that it would be a good idea in this sort of a field where we have got the international relations problem. We ought to have a uniform Federal policy for it.

My own personal feeling is that they ought not to be allowed to land. We have spent a good deal of time and effort and expert opinion establishing standards to protect people. It is going to be very costly financially to the airport operators if they are allowed to land, because they are going to have to purchase additional equipment. I can see we are going to have a foreign policy problem, but then, I leave that to the State Department; they are always working those things out.

Mr. MARTIN. Let me ask you a question. I am happy to see the legal profession bombarded a little bit here because being from the engineering profession, we have supposedly caused all these problems, and it is nice to see someone else get it. Is there no way that the American Bar Association, which represents the profession, could bring suit or action that would force an interpretation of the law to clear this mess up here? It seems a very lucrative field for lawyers to bring up the same subject in dif-

ferent States and never try to get a Federal interpretation of the law.

The legal cases you have enumerated here all deal with the same thing; you get down to the exact same point and no one seems to go further to bring it up for Federal interpretation. Why cannot the bar association or some civic minded group of lawyers bring this action, even if it goes to the Supreme Court for interpretation?

Mr. BERGER. You have a number of problems, the first being that the American Bar Association has no standing that it can file a law suit. There has got to be somebody to file it if they have been injured. The second problem is with the Federal court system. It is an old joke, "Don't make a Federal case out of it." This is where it came from. It is a heck of a mess if you try to get into the Federal court system, because they do their best to keep you out. The rules are set up to keep the Federal courts as clear of cases as the district courts could possibly do. They scrutinize the cases very carefully at the beginning. There are jurisdictional requirements that must be met before a case can be brought into the Federal court. Many of the cases I have discussed in here are cases where the court said, "We don't want to mess with that problem, baby. Take it some place else."

We have run into that problem in Los Angeles. We have tried to bring a case into a Federal court because we honestly feel that that is where it belongs. We have got to have Federal interpretation of this massive legislative scheme to find out what is happening. We run into all kinds of problems set up by the Federal court, as well as by the opposing party, to keep us from reaching a decision on the merits. It is a problem, I confess to you. That is why I have brought it to your attention because I think it is a sad thing that things came to this.

Frankly, if the FAA took all my suggestions, I would lose a good part of my practice and I would be happy to do it. I would like to get rid of this mess, and I think it is something you should not have to put up with.

Dr. MEYER. Perhaps when the Congress, in its wisdom, enacts some legislation on noise control and includes provisions for citizen suits, something the environmental defense fund or somebody else might want to follow up on is Mr. Martin's suggestion to get a judicial clearing of the air.

Mr. BERGER. I would hope so. It is interesting that the natural resources law section of the ABA, which is made up, to a large extent, of lawyers representing big polluting industries, is trying to put through a resolution by the ABA that such citizen suits would be maintainable only by individual people who could show that they actually suffered physical or property damage, as opposed to organizations like the environmental defense fund.

There are a few of us who are trying to stop that sort of loophole, but it is again another attempt to put a limitation on the right of access to the court before you even reach it.

Dr. MEYER. This has been a very useful discussion because it highlights one of the simple problems we have to come to grips

with, and that is: Where does the buck finally stop being passed? To that extent, we in EPA are going to use a number of existing schemes, including 102(C) provisions particularly with regard to the question of contracts between the FAA and airports. We are in the process now of evaluating whether the act applies to this. We have previously submitted to the FAA some of the testimony Mr. Berger has given. It will appear following his statement at the San Francisco hearing, and appropriate parts of it will be extracted following this testimony, so at least two sides will be in perspective.

At this point, it being 12:30, we shall recess for lunch. We will start these proceedings again promptly at 1:15. We have to clear this room at 5 o'clock because of other commitments. So with the number of witnesses remaining, we must get underway very promptly at 1:15.

(Whereupon at 12:35 p.m., the hearing was recessed, to reconvene at 1:15 p.m., this same day.)

AFTERNOCN SESSION

Dr. MEYER. We will continue, having had our lunch recess. We will proceed with Mr. Emerson Rhyner, deputy chief counsel, of the California Department of Public Works, who is representing the Honorable James A. Moe, California State Department of Public Works, who is going to present some views of his State on the traffic noise problem.

I will have to remind everybody that we have a long list of witnesses this afternoon and we do have to vacate this room as close to 5 o'clock as possible.

STATEMENT OF EMERSON RHYNER, DEPUTY CHIEF COUNSEL, STATE DEPARTMENT OF PUBLIC WORKS, SACRAMENTO, CALIF.

Mr. RHYNER. As you indicated, my name is Emerson Rhyner, deputy chief counsel for the Department of Public Works, California. I am one of those government lawyers that was recently commented on about an hour ago.

Dr. MEYER. You may expect a question, then.

Mr. RHYNER. I think I had better start off by saying I do not indulge in fun or games or ploys. With me today, from the department also, is Louis Bourget, who is an expert on traffic noise and has been for a considerable number of years. He is here to answer any technical questions that you may have. I might note in passing that he told me this morning that he has been a member of the Acoustical Society of America for a number of years, was a charter member of the San Francisco unit, and is now an associate member in Sacramento.

I have just a few introductory remarks, Mr. Chairman, and then we will go into the slides, if I may.

The California State Department of Public Works appreciates the opportunity to participate in this hearing on noise. The people of California feel strongly about this issue, and we in the department of public works are most cognizant of this public concern.

The California Environmental Quality Study Council has identified motor vehicle noise as a major part of the environmental concerns to which public agencies must be responsive.

Traffic noise problems are of such magnitude that people are demanding action. Parent-teachers associations, homeowners groups, and individual citizens are actively working to secure restrictive legislation to control motor vehicle noise.

Our legislature has declared a State policy to "take all action necessary to provide the people of California with freedom from excessive noise." Twenty-three noise related bills were introduced by the State legislature during the current session this year, six of which have been passed and signed by Gov. Ronald Reagan.

This problem stems from the 12.5 million motor vehicles which use California highways, including 560,000 motorcycles and 67,000 diesel trucks.

We have taken some steps to attack this problem, including extensive noise research. Noise impacts on the community are considered explicitly in location and design studies. Means of resolving noise problems are proposed in the environmental impact reports prepared for each project. Noise barriers and other methods of noise reduction are being incorporated into new construction projects as appropriate. On future construction contracts we are requesting mufflers on all internal combustion engines, including the heaviest earth movers.

We are firmly convinced from our noise research to date that to materially reduce freeway traffic noise requires a concerted three-pronged attack involving: (1) reduction of noise from motor vehicles; (2) adequate land-use zoning adjacent to highways by local government; and (3) proper highway design and location.

To set the stage for some specific comments on traffic noise problems, I would like to show you a few slides. These slides are intended to: (1) identify the problem, (2) indicate how it is perceived by others, (3) show what the department of public works has been doing to improve the situation; and (4) propose some possible methods of correction.

(A film presentation followed.)

Dr. MEYER. That was a very fine presentation. Do you happen to have all those illustrations in black and white? If so, we can reproduce them in the testimony.

Mr. RHYNER. I think we could arrange it.

Dr. MEYER. I would like, if possible, to insert that with the narrative on the transcript.*

Mr. RHYNER. We will go to work on it as soon as I get back.

Dr. MEYER. It is a very excellent presentation. Continue, sir.

Mr. RHYNER. These are specific and constructive comments on the slide presentation.

First, I believe that this slide presentation clearly indicates that some remedial action is necessary to alleviate present noise problems and reduce adverse impacts from future highway con-

*The narration is printed following Mr. Rhyner's testimony; the slides are on file at the Office of Noise Abatement and Control.

struction. It is our intent to develop a more comprehensive program aimed at combating the traffic noise problem.

Second, the most direct and effective approach to minimizing traffic noise is to reduce the legally allowable noise emissions from motor vehicles and enforce these lower limits. In addition to this statutory approach, techniques can be applied in the location, design and construction of highways to mitigate noise effects on surrounding areas. A third approach is through appropriate use of property adjacent to highways. Therefore, we are advocating a three-way attack for correcting and controlling the traffic noise problem with its interrelated parts.

With regard to reducing noise at the source—the motor vehicle: We actively encourage legislation requiring a reduction in motor vehicle noise generation over a period of time as advances in the state of the art permit.

(a) National standards need to be established to be most effective in reducing noise from motor vehicles which move freely across State lines.

(b) States, however, should be permitted to establish more stringent standards than those set by Federal law if they consider conditions in their area warrant.

(c) In California we intend to support further our State highway patrol in developing and expanding new law enforcement techniques and procedures.

We urge the Federal Government and private industry to join with us in research that will insure that progress is made in reducing noise generated by motor vehicles, pavement surfaces and tires, so that legally established standards can be met.

The second aspect of the traffic noise problem involves encouraging compatible land use. Local land use and building structure regulations are the prerogative of local government. However, it is our intention to strongly encourage local jurisdictions having control of land use and structures adjacent to freeways, to adopt land use plans, zoning, building, and housing regulations that will: (1) Establish land uses compatible with traffic noise adjacent to freeways; (2) make adequate provision for separation of noise sensitive activities from close proximity to freeways, and (3) provide for adequate sound reduction through both building design and site design to decrease noise impacts where sensitive activities must be carried on in close proximity to freeways.

We intend to make available to local government assistance in analyzing freeway traffic noise and evaluating land use control measures and modifications to building and housing codes.

The third major attack on traffic noise should be on reducing the levels of that noise reaching ears in sensitive locations. This can be done by locating, designing and constructing the highway system so as to minimize the impact of traffic noise upon adjacent noise sensitive activities. We intend to continue to apply our best technical efforts to attenuating traffic noise in our area of responsibility by:

1. Continuing research on noise-barrier design and the development of more sophisticated noise reduction techniques. We also plan to initiate studies on the noise generated at the

tire-roadway interface. We urge that the Federal Government support this research.

2. Better freeway design and location. The effect of noise impacts on the environment should be considered during each freeway route location study and during the design of each freeway project. We intend to consider the noise impact evaluations which are included in environmental impact statements presented at public hearings. The depth of each study may vary depending upon the degree to which noise pollution considerations may affect the location or design of the subject freeway.

We are now in the process of studying the effectiveness and cost of various types of noise barriers. We should endeavor to protect adjacent noise sensitive buildings and land uses through appropriate means such as depressing the freeway or construction of barriers on new locations where studies indicate they are effective, practical and financially feasible.

We should also endeavor to take remedial measures to improve noise conditions in areas adjacent to our present freeway system when widening or making other alterations, and there is definite evidence of substantial adverse community noise impacts from present or prospective traffic, where studies, as indicated above, indicate they are practical, effective and financially feasible.

CONCLUSION

I would welcome your comments concerning the proposals I have advanced for undertaking a concerted three-pronged attack on the freeway traffic noise problem involving responsibilities and action by different groups. But I must close with a word of caution. The subject of this presentation has been primarily related to noise problems associated with freeway traffic. This is not to imply that serious noise problems are not found along conventional (nonfreeway) highways.

We should recognize that noise is as much a problem along heavily traveled conventional roadways, with stop-and-go traffic. Conventional roadways provide for not only traffic mobility, but also access to adjacent lands. Because of the need for such access, construction of noise attenuation features, for example, are difficult.

The most practical and effective approach to alleviating the noise problem seriously affecting many homes, schools, and other noise sensitive areas adjacent to conventional highways is to reduce the noise from the source—the motor vehicle. This further emphasizes the need for all of us to join together in giving high priority to efforts aimed at quieting vehicles. Thank you very much, gentlemen.

Dr. MEYER. Thank you very much for a very excellent presentation of what your State is doing and what its thoughts are. I would like to ask a question before asking the panel if they have a few brief questions or comments. Obviously, some of your throughways are connected to another source of noise: Aircraft. Is there a relationship in existence within your State government in which the department of aeronautics and your department get together with regard to this total question of land use planning? Is there a mechanism for this?

Mr. RYNER. Yes, in the urban areas particularly—I am thinking primarily of Los Angeles and the bay area—there are agencies setup to join in the plan, land use and highway mobility, yes.

Dr. MEYER. I will ask the panel on my left. Mr. Martin

Mr. MARTIN. I have to compliment you on what the State of California is doing, because they are probably leading in this field. In your assistance to local communities, probably one of the biggest voids that now exists is for them to make a determination of what it is going to cost to implement any local ordinance. Are there any thoughts being given and undertaken by the State to develop some cost per decibel noise reduction, such as architecture, and what can be done?

Mr. RHYNER. Not as of this moment. I wish that this had started sometime ago. I wish that the problem of noise had been called to people's attention earlier; but as of this time we have not set up a cost ratio. I do not know that it would be a very easy thing to do. In this respect, I think our main effort will be to encourage cities and counties to use effective zoning next to the arterial highway, so that the proper uses will be there.

One of our biggest problems is the existing freeway, which may have been there 5, 6, 8 years, and then you have a developer who comes in and builds two-story homes right up against the fence. There is nothing you can do in that situation. You cannot build a wall high enough to take care of most of the noise. It is a very difficult situation. If that were zoned differently—a commercial zone, for instance, something like that—I do not know what cost there would be to the city, but it would certainly help to cure the problem.

Mr. MARTIN. Just that case in point, is there any thought of providing guidelines to making use of the home actually as a noise barrier? If you build right up to the road, you can force a building ordinance not to allow windows on that side of the building? Are there any thoughts along that line?

Mr. RHYNER. Yes. HUD has recently issued an order that on FHA-financed houses built next or near to a freeway, there must be sound protection within the house in order to get FHA financing. This may well spread to other sources of residential financing as well. I think it could well be effective. I think HUD should be commended for this action.

Dr. BERANEK. Carrying that point one step further, would it not seem proper for the municipalities to require this, rather than going to something as remote as financing by HUD?

Mr. RHYNER. That would be the most direct approach, yes. The reason HUD has had to do it is that the local governments have not. That is why we want to try to encourage local government as much as we can to take this more direct approach.

Dr. BERANEK. I have heard someone in the aviation field—I think it was an airport owner—say that land-use planning, meaning zoning, around noisy places, airports or freeways, has been almost a complete flop in this country. Do you feel that this could be more effective, or are we always going to have the problem of too many little local governments and no desire on

the part of larger governmental units to take over that aspect of zoning or land use planning?

Mr. RHYNER. First of all, I think it would be exceedingly difficult politically. I am speaking very frankly, gentlemen. It would be very difficult, politically, to take this authority away from cities which hold home rule as their No. 1 anchor and give it to a higher authority.

No. 2, speaking as a former deputy city attorney, I believe in the principles of home rule myself, as well as the administration in California. I think that at least we ought to try to encourage them to do it through their own local ordinances and see if we cannot get them to. If they do not, then we have got another ball game.

Mr. WISE. As a mayor of a large city with a lot of little cities around, I happen to agree with you, that the politics of that are extremely complicated. I am also president of the Dallas County League of Municipalities, which consists of 26 counties, towns, and cities with Dallas in the middle. When I became president, I could detect an immediate reaction of: "Huh, big brother is going to put his thumb down on you now," so your point is very well taken. Frankly, if I were a mayor of one of the smaller cities around Dallas, I would be hypersensitive about too much control by the big metropolis.

I would like to ask how you feel the citizen reaction has been in California to your increased emphasis regarding zoning as related to noise.

Mr. RHYNER. Regarding zoning as relating to noise?

Mr. WISE. Regarding your State, with an emphasis on the noise situation, such as on the freeways and so forth.

Mr. RHYNER. First of all, we are just really starting on the program. We have built a few noise areas and they have been well received. The matter of encouraging local zoning, we really have not gotten into yet. We are working now on the brochures and pamphlets that we are going to use, so it is really too early to find out about that. I would anticipate that it would be well received.

In California, as a practical matter, we have to get a freeway agreement with the cities before we can build a freeway through the city; not legally, but as a practical matter we have to. This is going to aid greatly, I think, in getting agreements through cities when they realize that we are going to do everything we can to cut down on this noise pollution.

Dr. MEYER. Before I go on to my right, is the State developing any recommended model laws or codes for the cities and other political subdivisions to consider in this regard?

Mr. RHYNER. I would anticipate that that would be included in our material, yes.

Dr. MEYER. We would like to be kept informed if you do.

Mr. BERLAND. I am a little unclear as to how you are going to encourage municipalities to pass such local legislation. Can you expand on that?

Mr. RHYNER. First of all, by giving them material showing the need for it and how to do it, and the results that have

been obtained through the one city, for instance, that we saw on the slide presentation, and conferences with them, both the administrative grants and the councilmen themselves. This is basically it. Whether the press can help and so on, we would be hopeful that they could.

Mr. BERLAND. Ostensibly, it will be an informational program?

Mr. RHYNER. Educational, information, and encouragement.

Mr. BERLAND. There is no other character?

Mr. RHYNER. We are looking for it.

Mr. BERLAND. I was also interested in your very model legislation in terms of regulating the noise of specific vehicles. There are two questions I want to ask you about that. One of them is what kind of reaction you have had from the automobile manufacturers?

Mr. RHYNER. Mr. Bourget will comment on that.

Mr. BOURGET. The automobile manufacturers have not been much of a problem. In fact, the average family automobile is pretty much in a condition of the state of the art as far as noise control. The big diesel trucks are our major problem. We are getting more and more cooperation as we go along. In fact, you noticed in the slides shown, the International Harvester vehicle. Incidentally, it was just submitted to some new tests before we flew back here for this meeting. Contrary to the statement in the narrative, the truck is down around 82 dbA, even when they threw in the Jacob's brake, which means that it would probably be a little less than that, around 80 dbA in normal driving on the highway. That is pretty good when the truck, almost without any controls whatsoever, ran 104-106 dbA.

Mr. BERLAND. I am referring to the standard vehicle you purchase. The other question about that is that I have a feeling that we are not able to effect any reduction, except for this model. I am talking about the kind of vehicles that people buy, that you are not able to effect any reduction in noise in vehicles, except through legislation.

Mr. BOURGET. The legislation has been a great help because all of the major truck manufacturers will give us the law, so that one will not have a financial advantage over the others in sales, and then we will all follow suit.

Mr. RHYNER. May I make one remark on that. Detroit now is developing the turbine engine and I think they are doing it on their own. It is not because any California legislation requires it. It is my understanding that the turbine engine will cut the noise level down, and this is a voluntary act.

Mr. BERLAND. I thought they were noisier.

Mr. BOURGET. Did you want to comment on that, that they are noisier?

Mr. BERLAND. It is my understanding that the turbine is noisier.

Mr. BOURGET. Yes, I have just had a recent conversation with Mr. Gilchrist, of the General Motors proving ground, and he said that they travel around the mid-1970's, 1978.

Mr. BERLAND. That is very good. With comparable horsepower?

Mr. BOURGET. Yes.

Mr. BERLAND. I would like to know what the cost of these noise barriers is, what your experience has been in the cost of noise barriers?

Mr. BOURGET. Sometimes the cost of employing earth contours as noise barriers is very modest indeed if the districts are adequately alerted, because you may have to haul the earth away and it might be even more costly not to have an earth barrier. The earth mounding requires more right-of-way than, let us say, a solid wall.

Mr. RHYNER. We have some preliminary figures on the construction of a concrete wall which runs about \$50,000 a mile for 6 feet and about double that for 12 feet. They are not cheap. You have the added problem of being hit by cars, and we will have to repair them and so on, but we are installing them now on new construction.

Mr. BERLAND. These concrete blocks?

Mr. RHYNER. Yes. I believe Mr. Bourget could answer this better than I, but a concrete block has an absorbing effect to sound, so it not only acts as a barrier, but it also absorbs part of the sound.

Mr. BOURGET. If made of cortex expanded sheet or Burtellite or something like that. It is also the cheapest form of a wall that exists at the present time, cheaper than most slabs.

Mr. BERLAND. It would be a lot cheaper to reduce the noise of the source rather than to wall us in.

Mr. BOURGET. It is often a twofold approach. If you cannot avoid coming too close to your residences and schools, you have to do something else to reduce your noise.

Mr. BERLAND. In the State of California, do your emergency vehicles have sirens?

Mr. BOURGET. Yes, they do.

Mr. BERLAND. That is a traffic noise problem.

Mr. BOURGET. The purpose of the vehicle, if it is fire or ambulance, counteracts any control; you must have something for emergency vehicles. If we have a freeway accident and you have got to remove injured people, they could hardly impose the same control. On coming back again, many firetrucks can be as noisy as they were going somewhere, but they certainly, in the opinion of the Public Health Department and our own, deserve some muffling, so that when they come back they do not make noise all this time.

Mr. BERLAND. I will not argue with you because of the time, but I will refer you to the American College of Surgeons about the use of sirens in an emergency situation, the effect on the people in ambulances.

Dr. MEYER. I thought one might want to take a look at the use of compacted solid waste materials for making barrier walls.

Mr. BOURGET. We will pass it along to our construction people.

Mr. WISE. I think I can add a little bit to that. Houston—I hate to say Dallas might take after Houston on something, but we might—has instituted ambulance service without sirens, the principle being more number of ambulances; in fact, one in each fire station, manned by firemen, so that arrival time is made shorter. Therefore, it is not necessary to get there as quickly.

That is what the principle is. Indeed, it has been most successful and Dallas is seriously considering doing likewise here within the year or so, and completely doing away with ambulance sirens. I do not know whether you can do that with police cars, and that is something I would like to look into, but as far as ambulances, there may be a point that the siren is not necessary.

Mr. RHYNER. That is very interesting and we will check into it.

Dr. JOHNSON. You say your three-pronged program—reduction of noise of motor vehicles, land utilization and highway design—evolves out of your research program. I am curious as to the makeup of your research program. Where was it located? How was it administered? Which department of the State, and approximate cost of such a program from which this three-pronged approach evolved?

Mr. BOURGET. Research has been continuing over some years. I refer you to highway research record No. 232, which contains an interim report by Beaton and Bourget that noise from highways be reduced by design. We were interrupted in our research program a great deal by the initiation of all these activities in California, which required training people in all of our districts to be able to make noise studies in the field, and we are just beginning to see daylight and getting back to some of our activities.

Dr. JOHNSON. Who is this "we"?

Mr. BOURGET. The research department.

Mr. RHYNER. I might tell you about the structure of our department. It is the department of public works which is essentially a highway, freeway and tollbridge department. That includes the division of highways, which Mr. Bourget comes from; the legal division, that I come from.

Mr. ELDRED. Getting back to this question of zoning, that keeps cropping up whether it is airport or highways, and there is always the problem of doing something that is equitable to the local people. I wondered if you considered anything in terms of incentives? What do you think? Whether something of that sort would have a beneficial effect.

Mr. RHYNER. It may be necessary. I do not know. We have pushed it way out there, if you know what I mean. We would rather get good zoning practices within the city, if we can, without having to buy it. It may be necessary, but at the present time we do not have any set of books.

Dr. MEYER. Thank you very much, sir, for a very, very excellent presentation. We appreciate your coming all the way from California and bringing it to us.

(The film narration follows:)

NARRATOR. (Sound). Defined as vibrations traveling through the air that are detected by the ear or as the sensation perceived by the sense of hearing.

Noise is defined as any undesired sound that is excessive, offensive, persistent or startling.

We can measure sound and noise on a sound level meter that indicates on a scale of decibels, called db, the degree of relative loudness of sound. Volume or loudness is referred to as a certain number of dbA.

Prolonged exposure to noise levels in excess of 90 dbA begins to damage human hearing. Unlike eyelids which can shutout light from the eyes, our ears have no protective shielding to shutout sound.

Interesting studies have been and are being made of the effects of noise on our everyday lives. Air and water pollution can be readily seen. But noise is the subtle polluter, one that can effect emotions and well-being as well as inflicting physical damage.

And noise pollution is estimated to be doubling in intensity every 10 years. In the past noise was considered an inevitable sign of progress and the price we had to pay for that progress. But as with our other forms of pollution this reasoning has become impossible to accept and impossible to live with.

What are some of the problems posed by noise pollution? In the many studies on the subject, it is always noted that sound and noise are very subjective phenomena. The reactions of people ranging from layman to experts can vary. Subjects can view the problems with differing perspectives because of interests and points of view.

The California Department of Public Works has been and is working with noise problems. We are interested in how the problems are perceived by various agencies and people concerned. And we hope these things will help provide us with more directions and answers.

An example of Federal concern—On May 20, 1969, the U.S. Government enacted the Walsh-Healy Act directly affecting 20 million workers. The President's report on noise stated clearly that between 6 and 16 million workers were threatened with various degrees of hearing loss from exposure to excessive noise on the job. The act limits their daily exposure to noise sources.

The Federal Assistant Secretary of Labor has stated: "The assault on people by noise is growing. Many ways to reduce noise levels are known and are practical. What is needed is greater attention to the problem and an attack on it from many angles, by local housing authorities, manufacturers; highway, rail and air authorities; and others."

The major sources of noise are many, but in California, the noise generated by all the different forms of transportation are the major cause of complaints about noise. Continued expansion of transportation modes will greatly increase this problem unless effective countermeasures are taken.

Effective noise control is a systems problem. Piecemeal solutions in the long run result in high cost and low effectiveness. The systems approach generalizes all noisemaking systems into three parts and their controls: the source; the path; and the receiver.

The eventual solution to the traffic noise problem must be to quiet the noise source. Much can be done to protect people from noise generated on our freeways. But only quiet vehicles can restore some tranquility to our city streets. California is working to quiet noise sources through legislation, through law enforcement, and working with the vehicle manufacturer. As early as 1939 the California Legislature began attempts to adopt maximum permissible noise limits for vehicles operating on California highways. California lawmakers are not unaware of noise problems in transportation.

State Assemblyman FRANK LANTERMAN. I came up to the legislature in 1951 and it took me nearly 17 years to achieve a level of sound measurement for the highway patrol, of a typical type of measuring device, the A scale decibel meter.

It has taken us a number of years since my initial legislation to get the meter as a legal device that will stand up in court for sound measurement.

NARRATOR. The 1967 legislative session finally achieved adoption of two vehicle code sections establishing vehicle noise limits on a lower decibel scale: 23130 applies to vehicles operating on the highway establishing maximum noise limits; 27160 applies to new vehicles at the time of sale. These codes are being enforced throughout the State by six California highway patrol teams measuring sound emissions and issuing warnings and citations.

Officer LARRY KIER (of the California highway patrol). Generally, as I say, my partner will be at some location removed from me, with the equipment, and I'll be parked generally within a quarter or half a mile and he'll contact me on the radio advising me which vehicle was in violation and how much it was in violation.

Most of our violations are due to inadequate or defective or modified systems. The majority of the passenger vehicles are because the systems are modified.

Anytime you modify the exhaust system of a motor vehicle and the noise level is increased, any at all, over what the noise level was when that vehicle was first sold new, then this is a violation of the California vehicle code.

NARRATOR. But we need to deal with the noise problem more completely. State Assemblyman Peter Schabarum expresses a similar view.

Assemblyman SCHABARUM. The California Legislature, in response to the broad concern for the environment, has focused also into the question of noise pollution. There are several legislators including myself, that have introduced legislation that attempts to deal with our serious noise problem.

Legislation includes the establishment of maximum decibel levels on new cars, trucks and motorcycles. Also decibel levels as it applies to existing motor vehicle population on the road. There are also pieces of legislation that go to the question of controlling or requiring certification of tires and mufflers that will be sold or used in California.

NARRATOR. As a part of the division's positive approach to the problems of noise, engineers at International Harvester have been designing a special heavy duty transport truck for the California Division of Highways. The truck will serve as an actual rolling laboratory for both the State and International. New exhaust systems and other quieting devices will be tried.

Mr. JOHN SULLIVAN (of International Harvester). It actually is a standard truck right now, but it's a new standard. It has a larger radiator than previous trucks. It has noise and splash shielding on the side of the engine compartment, it has sound absorbing material on the firewall, and a different exhaust system. It incorporates a resonator as well as the regular muffler to reduce the exhaust noise.

The biggest problem is reducing the noise level below the point we're at now, which is 86 dbA of the 1973 standard, is in the area of fan noise and engine mechanical noise.

NARRATOR. Some newer trucks are carrying exhaust systems underframe in the same manner as automobiles. Getting the stacks and their noise closer to the ground would allow lower highway noise barriers, reducing their cost. We asked Mr. Sullivan about this.

Mr. SULLIVAN. The overhead exhaust has the advantage of getting the fumes away from the highway surface and keeping smoke off the underside of the vehicle. Noisewise, it's easier to control the highway noise emission by the underframe exhaust. The underframe is usually more reliable.

Mr. RALPH QUALLS (from the California Division of Highway Equipment Department). This truck's going to be purchased by the division of highways and used on our transport running out of Sacramento all over the State. The advantage being that we can test it from time to time and make improvements.

This is only the beginning as far as we're concerned, because we're going to take up where International Harvester leaves off, and by a series of experiments, try to bring the noise level down even further, in other words, see how far we can go.

NARRATOR. The division is now involved in the important role of quieting the source of noise. We know that money spent quieting the noise of today's vehicles will undoubtedly reap the greatest benefit per dollar spent. But there are practical limitations. Current technology dictates that vehicles at speed will generate noise. At present, the division's most active role in combatting noise pollution lies in intercepting the noise paths between the source and the receiver. And our most effective tool is the noise barrier.

The barrier works by intercepting the line of sight paths between the source and the receiver. For instance, an 11-foot high barrier is usually effective in shielding a single story structure from a truck's exhaust noise. However the same barrier is much less effective in protecting a multistory structure.

The California Division of Highways prefers to use careful design, earth contouring or earth forms topped with low instead of high walls.

In any case, intercepting the noise emanating from vertical truck exhaust stacks is a different task. The resulting noise barriers are necessarily massive and expensive. California is considering the incorporation of low noise barriers into its new construction through sensitive areas. We will attempt to get the truck exhaust stack lower so that these low barriers will be more effective.

There are other methods employed by the division to block the noise paths between the source and the receiver but these measures are only a part of the solution. The final factor in the systems approach must also be considered.

The receiver. We can either soundproof the receiver or remove it from the noise. The division has soundproofed structures affected by noise from our

freeways. We have added acoustical material to an overcrossing structure successfully cutting sound reflecting noise from traffic below. We have modified school buildings reducing traffic noise penetration. But more effective solutions lie outside of our jurisdiction, in the realm of compatible land use.

Other problems and opinions concern new residential construction immediately adjacent to California's freeways without proper consideration of noise.

Mrs. ELIZABETH CUADRA (formerly acoustical engineer with Wyle Laboratories, now the Deputy Director of Office of Noise Abatement and Control in the Federal Environmental Protection Agency). We have quite a technology base, a great deal is known about architectural acoustics and how to predict how far sound will propagate. We know how to predict the noise environment of airports before they're ever built, freeways before they're ever built and so on. * * *

I've been appalled at the lack of utilization or even knowledge that these tools exist among the people who ought to be applying them. Especially people in local government. I have the impression that the concern of the people is way ahead of the realization of most of the city councilmen of this concern. Partly because there is no automatic channel for voicing it. You only discover it when you go in and take a survey or something like that.

People go in and buy houses where there is an obvious noise problem and they don't think about it until they're actually there living in it. Even people in some of the professions. We had an architect come into our office some months ago, who was the architect for a housing development in Orange County along a freeway. And they had the foundations poured for these houses, the designs committed and everything. He said: "We've got some of these houses about 25 feet from the edge of the freeway right-of-way, we think we may have a noise problem. Thought we'd see if there's anything we can do about it." You see he's come in when the designs are already committed, and unwilling to do anything but minor modification, so he's not really going to achieve anything.

NARRATOR. In southern California the city of Cerritos became concerned about homes near freeways. The origin of this concern was awareness of the fact that houses in an area adjacent to a freeway were transferring ownership at an unusual rate.

MIKE GOYER (Assistant City Manager). We zone so carefully to see that no industrial land use is immediately abutting a residential land use, we zone so carefully to make certain that our schools and other commercial manufacturing purposes are all compatible. And we're placing residential land uses right adjacent to freeways. Which seemed to make little or no planning sense.

NARRATOR. The city of Cerritos is exploring new zoning attitudes and in agreements with contractors for residential developments near established freeways, sound considerations in planning and construction. The city of Cerritos has taken a step in the right direction. It could have been a bolder step had the city known more about traffic noise sooner. What is urgently needed is a comprehensive approach to the total planning of transportation corridors.

The department of public works is preparing an informational package for city and county officials on building, housing and land use aspects of the freeway noise problem. This package will include model provisions on subdivisions and zoning ordinances, noise ordinances, and building and housing codes.

This completes the system approach. Truly effective traffic noise control is everybody's problem. Quieter vehicles must be designed and built; stricter laws must be passed and enforced; quieter highways must be built; and transportation corridors must be included in total community planning.

Local government officials must take transportation noise into account in their decisions on land development.

In the early 1800's Arthur Schopenhauer wrote an essay on noise, decrying the loud whip cracking carriage drivers on city streets, interrupting all peaceful and creative thought. He wrote: " * * * that the rude fellow deserves there and then to stand down and receive five really good blows with a stick."

Well, these have been some of the ideas on the problem * * * some of the concerns and some of the active projects of the California Division of Highways.

The whip-cracking driver has been replaced by other problems demanding our attention, our concern and cooperation.

Noise control is an idea whose time has come.

Dr. MEYER. At this point, I would like to ask Dr. James J. Flannery, of the Office of the Assistant Secretary for Water and Power Resources, Department of the Interior.

**STATEMENT OF JAMES J. FLANNERY, ASSISTANT
SECRETARY FOR WATER AND POWER RESOURCES,
U.S. DEPARTMENT OF THE INTERIOR**

Dr. FLANNERY. Dr. Meyer, distinguished panelists, I appreciate being invited to participate in this hearing today. Speaking as an economist well within the bureaucratic system of the Federal Government for a long time, I am fortunate to speak at this time in the schedule. I am impressed by the remarks so far and gratified at their close interrelations, even though the panel and the speakers so far have been so diverse that it proves again the statement so common today, from the ecologists and systems analysts points of view, that everything is related to everything else and you do not change anything without ramifications throughout the entire system.

With regard to Professor Lumaden's paper which was read this morning, some suggested they were dismayed that he appeared to be insensitive or indifferent to the implications of the decisions and the consequences effected in the marginal system. It is not so much that economists are insensitive—there may be such fellows—they have as much ego and sensitivity as any other groups, and their body of knowledge does not prepare them any better than any other group of society for making moral judgments—even though you can remind me that Adam Smith, who began modern economics, was a professor of moral philosophy at the University of Edinburgh, and since then I think whatever morals are in economics, they are in the footnotes or appendixes somewhere. The economist speaks on these all the time. He talks about equity and justice and fair play, as other groups do, but he is scared his credibility is not good and his body of knowledge is not well based in this area.

Going on from there, if you look back and say, How did we come here? The economist would prefer, in his principles, to rely more on the market system, the price system, rather than on Government regulation, despite the bad record of the market system. This would be his preference. This does not mean that he regards the market system as working well or ought not to be corrected.

If you just glance back, we have come to the situation we face today because we have, in effect, not overtly, explicitly, traded off some things for a diminution of the quality of life. We have traded off, in the sense we have accepted perhaps lower prices for products, maybe a bit better wages, better profits in the industrial enterprise, better dividends to the investors, and accepted as a consequence some environmental blights—insults is a more current word.

We were less aware or less conscious of those as time passed. We had a great economic depression for at least 10 years in the

1930's, into the beginning of the war. During that time we did not want to impair the recovery of the economy by requiring environmental considerations and controls on the economy. We wanted to get employment and wages and prices helped.

Then the war came along and we could forget it even more so. Population grew. In 1940, we had about 132 million people. Now we have over 200 million, and so the spread of the effect was more positive, more dramatic. The impact was greater. If you look at the Government agencies, this morning the FAA was taken to task rather severely. I do not know the FAA; I am not in there, but there is not one economist who could look at the FAA or any other Government agency and view it in the theory of a firm.

A Government agency represents a particular client, a constituency, those concerned more or less with the objective to that program, and the entire Government is sometimes called the representatives of bureaucracy. Who do they represent? Who are the beneficiaries? Who are the recipients? Who wants to see it formed? Who is affected by it? So the FAA may perhaps represent the aviation industry more so than the public. They may represent also the traveling public and not the residents around the airport. That is regrettable. I do not like it. The FAA and the other agencies are now having imposed on them the consequences of the Environmental Act of 1970 and have to be more responsive to other considerations.

The bureaucrat welcomes that. He has a legal base. He can say to his constituents: "I have to design this. I have to perform the program in this manner." The benefit-cost analysis has suffered from the same thing. It is a tool of the economist. However, it has been used to justify the program, not to evaluate it. It comes out in this way: It benefits our more well-known and our monetary effects and costs too. The nonmonetary benefits, the nonmonetary costs are mentioned in passing. They are descriptive terms, a paragraph or two, but we all know now that benefits and costs, the nonmonetary ones, are the more significant ones. They are the ones that make us complain. They are the ones that represent the diminution in the quality of life.

Noise is a particular aspect, a variation of the environmental insults, environmental economics.

I was impressed by the last set of pictures that showed a newly designed truck. There was no mention of how much more it cost, what its price was.

I may remind you of a little experience we had 6½ years ago now. There was a high level, cabinet level committee, an economics incentives group on pollution control, an economist's fond view of life, with the price system, who said that if everything is managed sufficiently well—we see that in phase 1 or phase 2—we are going to be rescued by these kinds of things. We had noise on the top of our list. We dropped noise, not because it was not significant, but because there was little we could do then—we had a 6-month timespan. Here, air and water pollution control are further along as programs.

The public market response to them, the insistence, the demand for the political process that some corrections be taken.

But we looked at noise for a while and we looked at the noisy machines. We decided we could not do anything about those things in the residential realm, in the individual households, the power mower, the window air conditioner, and maybe the power tool, and we would not get the individual person to respond to that. We might be able to use the economic weapons, economic devices, economic controls, through law on commercial enterprises.

For example, this morning a man could not go out and complain about the chain saw in his neighborhood because he could not get the instrument out there to measure it to make the complaint effective. We thought we could go after the truck and thought we could use a license fee at a sufficient level to encourage replacement of it. We put a burden on it and it would inspire the guy who owned it, the guy who used it, because he incurred more cost and he would seek to replace it with a better designed device with a built-in noise control, so he could avoid this cost. This would be fine.

It did not take us long before we got to realize that what he would do probably is pass on those costs. He would pay the license fee and make that just the cost of construction. He would pass it on to his client, and that would be of no use. We have to look at who bears these costs in the end. If we have a newly designed truck that passes only on to the freight rates, it may not be so bothersome. We want to take this license fee; let them write it off for tax purposes in a much shorter period of time, half of what it is now or a fourth, if society so deemed. Then he would have the device written off. He would have a scrap certificate issued perhaps by the IRS, and he would actually remove it from use and put it on the scrap heap to be taken apart.

We would accelerate, in other words, the normal depreciation. In the same process we would have standards. There were described this morning the professional societies who do the decibels, what would be the minimum or maximum noise level, the 90 or whatever the scale was, that say no machine could by law be produced for these purposes that did not meet these standards. We would rely on the professionals to say what those standards would be; then the market would respond with machines of this scale. The Government regulation would not go any further than that. It would not prescribe what it would be, just as long as it met that standard.

We did not probe that for various reasons. The statement was that the time was ripe. But looking at what the anthropologists say, a change comes best, it is more readily acceptable if it is built on the past. When we changed the system in civil rights for groups that had been disadvantaged, when we changed that situation, we pinned it back through our history, our Magna Carta, our Declaration of Independence, our Constitution, and read phrases like freedom and justice for all. We recognized there were some groups who did not get freedom and justice. It made the transition point—not a great dramatic jump into some unknown realm. We thought that there, too, we could go along with things we already knew.

Mufflers were already on automobiles. If we could use the same things in the economic system, and the Government indicating the direction by guidelines and law, we could achieve that aim. We could go this way. We still think that is a more desirable way to go. The Government would prescribe minimum standards based on the scientific engineering knowledge we would get and the advice received from professional societies. The economists would try to trace out the benefits and the costs, the distributional impact, and we would look then to whom do they fall on. Who bears these costs? Are they borne by local governments?

The New York City subway railway is very good in this respect. We have got a 30-cent fare. It may well be that it would be still desirable to put the noise controls on the subway and run the subways for free because of the social desire of the subway. It is inconceivable to close the subway or to price it so high that you reduce the patronage of that subway.

This does not mean that the economist would know what is justice or what is that one group that is better off than another. It only shows the incidence of it. Who bears the cost? What are the ramifications? He would not have his furrow going all the way through. His system is not that good; his data are not that good; his insights are not that good; but it would depend on the lawyer, the engineer, the scientist, all the rest who are interested in society. It would rely on the responsibility of the man who is elected, his wisdom, his skills, and bringing people into the discussion, trying to achieve what the consensus is, how powerful, how articulate is the group.

Back to the pictures and the highway noise and the building of the screen, the barrier, I just wonder whether guys buying houses close by got a lower price on their house. Perhaps they did. Even if they did and they moved in, later on they still had the opportunity and they were most willing, probably, to complain that they ought to get a barrier anyhow. The barrier would be pushed off as a public cost. Should they pay some of that cost?

We have an analogy on the waterside. We call it flood plain zoning. The Government has moved into flood protection insurance for the guy who lives on a flood plain. The Federal Government will pay one-half of the insurance premiums if the local government has zoned it, has said that no further buildings, housing, nonconforming uses shall occur in the flood plain. That is marked in this thing by the geological survey and their estimations of the rise and fall of the rivers and how far they would go into the area. Then it is proclaimed, so that the real estate developers, the guys who have the opportunity to make the investment decision, buying the house and so forth, know where it is. Those already in the area are eligible for the insurance. A guy coming in there later on, building in there despite the information, is not eligible for the Federal portion of the insurance and no insurance company will insure him.

Here we have a flood that occurs only once in a while. The noise is there every day. However, the flood can eliminate the guy, ruin his house, and maybe even affect his life, drown him. You have this option, but we do not put that burden solely on the local constituent. This means that you do not need the big

dam upstream, the high cost dam which only the Federal Government pays for.

We are undone, oftentimes, by our own economic conceptions, the economy of abundance, that benefits are wide-spread. We allow the big noisy truck down the highway and accept the noise because the big noisy truck supposedly carries the goods and services to the rest of us at a lower price, so that we all benefit. Because we all benefit so largely, we also accept the abuse of the noise.

We did not measure, of course, how much noise it was, and who was abused and who was benefited. So economists would like to put the costs back on the trucker, and if you pass along the price of this freight to the grocery store, OK, that is better. It would induce a truck designer to design a better truck, so that the mass economy can occur at the low price.

When you move it over into the public realm, into the government circle, you do not know who pays for it—the personal income tax, the corporate income tax, excise taxes, Federal taxes, State taxes, local taxes. What is really hoped for, it has shifted over into the cost of government, that somebody other than the particular guy involved, other than me—you pay for it, I don't pay for it, I get off relatively free—and flood control—that is what happens—the guy builds his place there but he does not pay for the flood control.

If we can shift the design of these noise controls—We have done it in water pollution—here is the treatment complaint. All the industrial wastes go into that plant. None of the ones disposing of the waste is required to reduce his waste. That waste control is generally paid for through general taxation. Maybe there is some sewer rental charge, which is relatively nominal, and Federal money goes in there 50 percent.

We have much lower cost plan by controlling the waste at the source. The guy would redesign the system, and he would be more careful in his operation. Try to get that cost back at the guy who starts the thing, who designs the machine, the guy who uses the machine, if he has to pay for the cost of a less noisy power it will be reflected in the price.

If we accelerated the change of things, knocked the old ones out and the new ones in, presuming that the new ones would be less noisy, we might be helping the economy in another way—we would get more productivity, more efficiency, more employment.

This may be awfully glib; this is piety, but there is this possibility here; it requires another set of considerations, building with them, not denying the previous ones, joining with them, saying can we devise such a system a bit more rationally and with a bit of promise in it, so that we get closer to the goal of the quality of life. How much is the government cost? Survey plans? Monitoring? Administrative costs? Those would not be minimal, and maybe the Federal Government would have to have a lot of grant programs to help the States and municipalities do the administration and the daily business; but it would not be of the magnitude of the water pollution game. Here, we would

rely on American ingenuity and local perception, the consumer preference, and participation.

This is a hopeful statement, maybe more optimistic than the times admit, but if an economist has anything to say in this regard, then this is the route the economist would prefer to go. He wants to go, of course, but he cannot go, other than with the rest of the intermingled, mostly intertwined associates. Thank you.

Dr. MEYER. Dr. Flannery, thank you very much. I appreciate several things that you have said, one of them being that the members of various professions and scientific community are no better arbitrators than politicians or anybody else. I also was appreciative of your comment about the unfortunate trap that some people fall into of using cost benefits to justify the programs, not to evaluate them.

I would like to turn that around to the viewpoint of the Chair and say that certain segments of the various communities are also inclined to use a cost benefit analysis method to attack programs that they do not want to see implemented or which they think would cause them unnecessary cost, rather than use it to evaluate them. I think you know exactly what I am talking about. It is a very difficult problem.

Dr. BERANEK, do you have any questions?

Dr. BERANEK. I think I will pass.

Mr. WISE. I think I will pass in the interests of time.

Mr. BERLAND. I remind you of a suggestion by the London School of Economics in regard to noise. It applies this way: Perhaps what we ought to do is have the airlines pay a tax to all of the homeowners who live in the area around the airport, whom their noise interferes with, and then as they get quieter and quieter airplanes—it would be related to decibels—they could reduce the level of their tax. You might agree with that?

Dr. FLANNERY. Yes, that is true. We have said, in the awkward phrases of economists all the time, here you would compensate the guy who has got the adverse affect, pay him to put up with this abuse until you are able to design a less noisy machine. That would be some semblance of justice that is not manifested right at the present time.

Mr. BERLAND. Would that take legislation?

Dr. FLANNERY. It probably would. And then we would get the lawyers who would say: "What is the equitable price?" Maybe the economists would be able to establish about 15 different equitable prices.

Once in a while we have some experience of this. On the Delaware River estuary, one business corporation paid another on the site for those days in which the first corporation discharged some acids into the stream that the second corporation was adversely affected by, and rather than getting involved in court, company A paid company B until such time as company A could modify its process. This was a private agreement between the two companies, you might say at public expense, in that the rest of the offended groups were unnoticed, uncompensated, but it established the idea, anyway.

Sometimes I think with the highways, some payments should be made to property owners whose property values are diminished, like an easement.

Dr. JOHNSON. I wonder if you also have a measurement of prudence to go along with your philosophy of operation?

Dr. FLANNERY. That is a very good point. The so-called spillovers or side effects are not all adverse. Sometimes they are spillovers that enhance the property value of a particular entrepreneur's opportunity to gain. Should he then gain because he was benefited incidentally or in a manner in which the system does not now provide for a collection—the flood control is a very good one—property value goes up.

Dr. JOHNSON. I meant not only improvements of individual properties, but general improvement in the quality.

Dr. FLANNERY. Of the instrument. I see. The better designed engine. Well, we would hope that the better designed engine, the corporation who does it gets more of the market or gets a better price for it. He has got the Cadillac instead of the Tin Lizzie. Maybe it is very lean, but that is what we would lean on. The market does not register that, or give the guy the benefit of that. If it is done through public means, through a government action, maybe we would have to devise a tax levy or a windfall benefit of some kind. That is what I would say on that one.

Dr. MEYER. Thank you very much, sir. This statement of yours, with your thoughts on environmental economics, is going to be extremely valuable to us in structuring some of our environmental programs, and in setting the stage for more of our studies.

At this point, I would like to ask Mr. Joseph Singer, American Association of Home Builders, if he will hold forth.

STATEMENT OF JOSEPH A. SINGER, NATIONAL ASSOCIATION OF HOME BUILDERS

Mr. SINGER. Mr. Chairman, members of the panel, my name is Joseph A. Singer and I am a homebuilder from the Philadelphia area. I appear before you today as chairman of the environmental control and energy task force of the National Association of Home Builders. Our organization has over 54,000 members in nearly 500 affiliated State and local associations, and our members build about two-thirds of the housing annually constructed by professional builders.

The National Association of Home Builders has been conducting technical research and studies for more than 20 years in efforts aimed at reducing the cost and improving the value of homes and apartments and their environment. Nearly a decade ago, we initiated efforts relating to noise and sound conditioning. "Quiet House" programs were undertaken to familiarize the consumer with well-designed housing incorporating special "quiet" features and to determine the consumer's interest in such features. Shortly thereafter, a residential sound conditioning manual was developed to aid builders in providing cost effective acoustical housing environments. Some reasonable level

of performance were suggested, taking into account the variable effect of background sound levels and occupant satisfaction. It also set forth many practical construction techniques and details aimed at improving acoustical performance. The NAHB Research Foundation, Inc. has just completed a substantial revision and addition to that manual which we will be glad to supply to the Agency as soon as it has been printed.

Dr. MEYER. We would appreciate it, sir.

Mr. SINGER. In addition, the NAHB Research Foundation, Inc., has been continuing research sponsored by NAHB and other interested industry companies and organizations to measure in-place acoustical performance in relation to construction, the background noise levels, and the subjective response of the occupants. We believe this research was the first such intensive effort conducted in this country and perhaps the first conducted by private industry not related to public housing or other governmental activities anywhere in the world.

Three such studies have been made, involving measurements of airborne noise reduction, impact sound transmission with various impact sources, plumbing, appliance, and mechanical equipment noise both within an apartment and transmitted to other apartments, and the interior and exterior ambient noise levels. These measurements were made at project sites where normal techniques of construction were being used. In none of the three studies was the builder influenced to change either his construction technique or his supervision. Thus, we believe the structures studied are reasonably representative of general practices. In addition to the observation of construction and acoustical measurements, a survey of the occupants was made (by an independent research firm) using a carefully designed questionnaire to probe the general attitude of tenants to their apartments and surroundings, and to determine specifically their response to intensive questions about their acoustical environment. This testimony is based in part upon the results of these studies, wherein we have been able to identify some of the problem areas that merit consideration for additional research and development.

The problem of determining precise acceptable levels of "quiet" performance is extremely difficult to resolve. It is generally recognized that roughly one-fifth of the population is relatively insensitive to noise, while an equal proportion is usually sensitive to noise. Thus, we cannot expect to be able to satisfy everyone. At the same time, we must recognize that each improvement to performance level also increases the cost of housing. It is essential that we strike a balance between cost and performance that provides a reasonable degree of quiet without adversely affecting the ability of all Americans to live in decent housing.

Mr. Mayor, I do not know if you are aware of Mr. Fox, from Dallas. Some years ago we attempted to develop the "Quiet House" and to acquaint our builder members with various construction techniques within the house and special appliances and special equipment to reduce the noise level in the house. Mr. Fox attempted to offer this as an optional extra to his normal

house package—I think at about \$1,000 additional cost. He found that while everyone was interested in the techniques, very few people were willing to spend that additional \$1,000 to have that kind of quiet in their house.

However, Mr. Fox, who was a very enterprising man, realized that there should be some levels within the house that he had to offer this kind of service, and scaled his \$1,000 package down to \$100, dealing primarily with areas of high noise level—the kitchen and laundry areas and so on—and found that there were many more people who would buy these kinds of acoustical devices within his house to serve their own purpose, so that somewhere between the level of what we would really love to do in terms of getting the kind of acoustical environment in the house that we should be doing, and what we can afford to do in terms of meeting the market—

Mr. WISE. May I interject something here? Assuming that there is a little publicity in the local newspapers, which I trust there will be since there is a reporter from the Dallas News here today—it will be interesting to observe, after such publicity in the paper and after the idea of the noise abatement principle being publicized in Dallas, whether Mr. Fox would then be able, in light of that publicity, to add that \$1,000 and how many customers would be willing to pay for it.

Mr. SINGER. That is a very good thought. It had not occurred to me when we were developing the testimony. Dave Fox might have been a little early for the market; he might not be at this time, given this set of circumstances.

Mr. BERLAND. You do not say here, but how much are these houses that you are talking about?

Mr. SINGER. They were in the \$20,000 range, somewhere between \$19,000 and \$20,000.

Mr. WISE. He has two general price ranges. One would be in the area of \$20,000 to \$25,000, and the other would be in the area of \$35,000 to \$40,000.

Mr. SINGER. Our studies, and those of others, indicate that generally the most significant acoustical problems are those between apartments, while noise sources within the home or apartment are of less concern and exterior noises are least disturbing. In apartment buildings, structure borne noise transmission is the cause of most disturbance, particularly impact noises such as footsteps. Plumbing and appliance noises are the next most bothersome disturbance since they are developed both within units and are transmitted between units. Of course, some specific exterior noise sources, such as airplanes, can be extremely disturbing to both the homeowner and apartment dweller in specific situations.

Airborne noise control through party walls and floors is not as significant a problem as it was 10 to 20 years ago. Manufacturers have developed and builders use a variety of constructions providing adequate airborne isolation. If proper planning and installation techniques are used, current guidelines of the Department of Housing and Urban Development appear to be adequate. In our studies, we have not been able to identify complaints about airborne noise intrusion where the separation

provided a field-effective sound transmission class of about 48 or greater. Unfortunately, electrical outlets in party walls often reduce the effectiveness of otherwise satisfactory construction. Revision of the national electrical code, and changes in local enforcement practices are needed so that electrical outlets are not required in party walls. Placing an equal number of outlets near party walls can provide adequate electrical service in most cases.

The problems of economically isolating sources of vibration from the building structure deserve considerable attention. Basic to solutions is the need for development and acceptance of measurement techniques and rating methods which provide a high degree of correlation between changes in performance and subjective response of occupants. For example, the generally used ISO method of test for impact sound transmission utilizing a standard tapping machine and the impact insulation class rating system have been shown to give equal ratings to floor construction which vary by a factor of almost 400 percent in loudness of transmitted footfall noise. The proposed method of test for impact sound transmission to be included "for information only" in the next ASTM book of standards does not change this situation. It only provides a much better definition of the test method. Other tests which relate transmitted noise to masking noise levels or detectability offer some promise of showing improvements in the desired correlation, but much research remains to be done. Only when such improved methods of evaluation are developed, can we hope for development of practical constructions and installation techniques that can reduce the problem. Similar comments are applicable to problems of transmitted plumbing and appliance noise.

People can also be disturbed by many noise sources within their home. For some of these, such as the disturbance due to activities of other family members, each family develops their own noise control techniques. Judicious setting of the hi-fi volume control is just one such method.

But for several potentially bothersome noise sources, the occupant cannot control the intensity of noise. In our various studies, it was found that from about one-third to two-thirds of occupants are bothered by the noise of kitchen appliances when they are in another room. Approximately 10 to 15 percent of the people find certain bathroom noises bothersome.

One of the recent attempts to provide a good acoustical environment is HUD's establishment of interim standards for evaluation of community noise. While this standard is aimed at avoiding HUD's association with projects where existing or predicted noise levels are unacceptable, similar techniques could be applied to such uses of land as manufacturing, office buildings, institutional buildings and others. Because the interim standard is only a first step and its effect has not been tested, we must, however, reserve judgment on its practicality and, of course, on the criteria themselves. Furthermore, for a subjective phenomenon like sound, the wisdom and flexibility of administration in applying this standard will be especially important.

Obversely, and perhaps more appropriately, government planners at all levels might be required to consider the affect of new highways and airports on the noise levels of existing or planned land uses prior to the decision to impose such facilities on the local community. Obviously, such facilities should be designed to minimize their impact on these other land uses. In extreme cases, where such facilities would produce clearly unacceptable noise levels, the project should be discontinued, rerouted, or relocated.

We believe that the Environmental Protection Agency and other governmental agencies should encourage and support the continuing and coordinated research into the effects of noise on people, the development of techniques of measurement and evaluation of noise, and the development of practical and cost-effective noise-control techniques, all in relation to people and their environment.

Specifically, we suggest that further acoustical research is needed on the following subjects:

(1) Automobile and truck noise, including the design of efficient yet quiet engines and exhaust systems, truck and automobile tires, and techniques of highway design to minimize its effects upon the surrounding land use.

(2) Aircraft noise control, including the development of quieter engines and aircraft use patterns that minimize intrusive noise while providing safe, efficient movement of people.

(3) Structure-borne noise transmission, including development of physical evaluation techniques that permit rating products and elements of dwellings and buildings in the manner that people respond to them in use. This should include studies of the vibration response of buildings and components to impulsive and steady vibration sources, and development of reproducible sources that apply inputs similar to real-life events.

(4) More cost effective methods of reducing appliance and fixture noise.

(5) Development of economical, practical, and market acceptable window and door systems specifically designed to minimize excessive exterior noise intrusion, such as from aircraft and heavy traffic, in single and multifamily housing.

Additionally, EPA might consider study of enforceable legislation and regulations which local and state governmental bodies could use to keep exterior noise and disturbance at reasonable levels.

Finally, EPA should encourage manufacturers to label noise levels of appliances, equipment, and related items under a rational and consistent rating system to inform consumers so they may evaluate the equipment in relation to noise.

We thank you for the opportunity of appearing before you today on this important subject. If there are any questions that you might have, we would be happy to try to answer them.

Dr. MEYER. We thank you for giving us a deep insight into what the National Association of Home Builders has been doing. I would like to ask one question, and then ask the panel if they have any. In reference to the national electric code, has NAHB made any advances toward the proper authorities in this regard?

Mr. SINGER. Yes, sir; we have suggested that their rules be relaxed in terms of the number of feed outlets, and that we be allowed to use outlets on walls that are not party walls to serve that same purpose. I believe it is under consideration.

Mr. MARTIN. Mr. Singer and Mayor Wise, I would like to address a double-pronged question, one that relates to local community action. The optional \$1,000 to get the home insulation-noise insulation—do you feel that the possibility of regulating this kind of home noise regulation and possibly waiving real estate tax on that portion of home costs related to noise insulation would have an acceptance?

Mr. SINGER. No. I think Mr. Wise can probably answer that tax question a lot better than I could, having some idea of what his fiscal problems may be in Dallas.

Mr. WISE. The answer is a rather emphatic no. No. 1, noise pollution, unlike air and water pollution, is not visible. Therefore, it is not yet completely accepted by the general public. However, the sensitivity that I referred to a few moments ago of the general public in the area of noise control is increasing all the time. It is interesting to me. I heard a hammer over in the next room; everyone looked around. The telephone rang, and everybody in this room looked over at the telephone.

I accused Dr. Meyer in Dallas, when he held this hearing. A vacuum sweeper was planted right outside the door in the very first 10 minutes of the panel in Dallas, and I am still suspicious that he planted it there. This was a vacuum sweeper which specifically obtained to your home building area.

My point is, as people become more sensitive to noise, then it will become more acceptable; but at this time, no, I do not believe anybody would be willing to shell out any more tax dollars for anything.

Mr. SINGER. Our suggestion—and hopefully we could get the manufacturer to follow through, where they themselves would rate their own equipment—might allow the general public to choose a little more effectively in terms of its choices for the kinds of appliances and kind of equipment they would like to use in their own home.

Mr. BERLAND. In your presentation, you put a great deal of stress on external noise, but I would like to go back to the noise in the home. You made one short remark, saying that NAHB has long supported model building codes. I would like to know what leadership NAHB has had in this regard.

Mr. SINGER. May I ask Robert Montgomery, who is a member of the research foundation. I think he can give a much fuller picture than I can.

Mr. MONTGOMERY. We have been working for a number of years with all of the model code groups. We have instigated and tried to obtain from the various code groups a unified model code for residential construction.

Mr. BERLAND. Does this mean you are trying to get a code that can be adopted, or has your organization also attempted to go to municipalities?

Mr. MONTGOMERY. We believe the first step is to obtain a uniform model code which is applicable to residential model construction. Once we have such a code, we would then make a more serious effort to get local municipalities to adopt this type of a code.

Mr. BERLAND. Would it not be helpful, for the national picture, for this country to do what Canada and the countries of Europe have done; that is, to adopt a national building code?

Mr. SINGER. Yes; if you are asking our opinion. We agree that this would make some sense if we could get the four major codes to give up their own jurisdiction in terms of how they feel about the thing. We have been working with them and hoping to achieve this within the framework of the four major codes, so that whether you go north, south, east, or west, basically the code dealing with residential construction should or could be the same, and then work through our membership to get local State legislatures or local communities to adopt one of these national codes for itself.

Unfortunately, what often happens is there is the adoption of the code and the amendment of that adoption to meet its own local conditions, which negates the whole question of the uniform code.

Mr. BERLAND. I am asking if it would be better to have a federal law which would specify certain basics in building, such as sound transmission?

Mr. SINGER. Hopefully, we would like to see it not done from the Federal level, but if it is the only way we can achieve it, we would say we would have the Federal level.

Dr. MEYER. The Chair would make a comment that the proposed legislation now pending in the Congress, both as suggested by the executive branch and by the legislative branch, includes a mandate for the EPA to develop model codes. If this legislation is enacted, we will seek to work with organizations such as yourself with a view toward (a) meeting your first requirement, and (b) assisting in the enactment of the codes at the State and local level.

I think Mr. Berland's point is important, that we need to attempt to get some uniformity.

Dr. BERANEK. As you know, Housing and Urban Development has certain building noise codes that apply to FHA financing. Is that kind of code which they have developed a workable one to build on in this country? Are you familiar with it?

Mr. SINGER. Yes, I am. Yes, they are workable. The question does deal with a fact of the level at which we look for noise reduction within the structure and between structures. It does a good job as far as it goes. The standards are called minimum property standards, and I think you ought to understand that that is what they are.

Mr. BERLAND. They are really recommendations? They have no legal standing.

Mr. SINGER. No. If you are building housing that has insurance by the Federal Government, those standards are the standards that you build by. There are different kinds of stand-

ards. There are standards for single-family housing and standards for multifamily housing, and they do differ.

Mr. BERLAND. They are really recommendations to the mortgage house, in effect. There is no penalty if you do not build it right.

Mr. SINGER. Excuse me, they are not recommendations to any mortgage service. The FHA or HUD now examines plans that are submitted by developers or builders. The determination of the satisfactory standards of those plans are determined not by any mortgage source, but by HUD itself, so that it makes its own review of plans and sees that its own minimum property standards are satisfied for any of its developers. Once again, they are minimum property standards.

Mr. BERLAND. The issue is whether or not the loan is insured by the FHA.

Mr. SINGER. If you say you want to use that form of financing, then you meet that standard that they set forth in their minimum property service.

Dr. MEYER. It was asked in one of the hearings, recognizing that because FHA and FNMA mortgage insurance make up such a substantial part of the market, whether there exists a non-federally financed portion of the market large enough so that it would be useful for EPA or the Federal Government to work with various lending companies, such as insurance companies, banks, building and loan associations, to establish voluntary acceptance of provisions similar to the FHA, HUD provisions. I presume you would endorse that as a very good idea?

Mr. SINGER. Yes, sir; except for the last year or so, when money has been a factor in housing. The FHA home programs only account for about a third of the construction. Two-thirds was what we call conventionally financed, not under any FHA insurance. U.S. Savings & Home League, and trade associations of that sort certainly should be able to have this kind of data for itself and its own members, so that it can evaluate the housing that it places its mortgages on.

Dr. MEYER. It seems to me it is another area in which EPA and your association, the Acoustical Society and other professional societies, can get together and work on a voluntary basis. We are going to be talking about this in the very near future.

Mr. SINGER. I noticed the horror story in California. I was here early enough to see the pictures. It is unfortunate that those kinds of things happen. I think there is a need to communicate more between professional people, perhaps the acoustical engineers with the planners. Builders tend to be very independent and entrepreneurial, but not to the point of being self-defeating, and the kind of housing we saw in the picture in California tends to be self-defeating. Certainly, the National Association of Homeowners would not hesitate at all to find a regulation promulgated by local planners and local zoning boards that would prevent the kind of condition that we did see.

Dr. JOHNSON. I would like to ask the chairman a question. You said that there is an action in process regarding the EPA developing model codes. What types of codes?

Dr. MEYER. The legislative proposal submitted by the President called for a broad technical assistance program within the EPA on the subject of noise, to include assistance to the States and enforcement programs, and also including specifically, but not exclusively, a system of developing and recommending model codes, laws, and ordinances relating to the problem of noise in general.

This technical assistance program—just so the record is clear—is not limited to these two areas.

Dr. JOHNSON. My question to you, sir, as regards the code that you speak of, it is not clear to me who makes these codes, who respects them, and how many different sections of the country are covered by codes, and who respects the codes in the various parts of the country, the community relationship between these codes and in municipalities and States—I think we have already covered the Federal Government somewhat.

Mr. SINGER. Really, it is not a question—not for me. It really deals with some technicality with codes. My making an interpretation of the people who make up BOCA code.

Dr. JOHNSON. Who is BOCA?

Mr. SINGER. Builders Official Conference of America. That is one of the major construction codes in this country. There are four major bodies that deal with construction codes. Hopefully, the State of Pennsylvania—I believe you are from State College—is moving toward getting some model code legislation enacted in the State, which can then be used by the State itself in terms of the health code, the plumbing code, and manufactured housing code.

The State of Connecticut has moved in that direction. There is the Southern Building Code Congress; there is an electrical code dealing with construction—I cannot think of the names. I am not an engineer and I do not come in contact with them, but they have various jurisdictions, various governmental bodies. They all promote their own code. They are supported, I presume, by manufacturers who give them materialistic tests.

Dr. JOHNSON. I thought you were speaking of the NAHB codes?

Mr. SINGER. We do not promulgate any code. We are for a uniform code, hopefully nationally, that can be spread across the country.

Dr. MEYER. While we are on that subject, we ought to keep in mind several things. One is that a recommended national plumbing code analogous to the noise code was developed and promulgated. The usual procedure is for municipalities to enact and modify that code. The national plumbing code is an example, as developed primarily under the auspices of Department of Health, Education, and Welfare, with a wide group of professional societies, elements of labor and building industry and so on participating. It is available through the Government Printing Office. It has no legal status until it is adopted by a municipality.

Similarly, groups such as the organizations mentioned here have regionalized, attempting to come up with building codes which simplify the problems of the community of various muni-

cipalities. To use an analogy, the process of developing these codes is somewhat similar to the American Standards Association, the Acoustical Society recommended standards. Sometimes it takes just as long to get agreement on some of those standards. It is almost analogous, and they are just enacted in the law by various municipalities.

Dr. JOHNSON. I thought they had another new set.

Mr. ELDRED. I would like to return to that California horror story. Unfortunately, it is not an isolated incident. I wonder if your association has any recommended practices or any other mechanism for suggesting how not to do this thing?

Mr. SINGER. Yes, we do. We have a fairly large and extensive staff of planners and engineers, and we are on a constant educational basis with our membership in terms of having their people learn better planning techniques, understand better planning techniques, and to adopt these planning techniques in their own development. I think we have done a very fine job.

We, along with the Urban Land Institute, for many years sponsored a better research program dealing with better uses of land. That is why I would say I have no hesitancy for having planning commissions dealing with some of the problems I saw today. I am not familiar with it in other places, but I saw it on the slide this morning. We could get the planners to understand the need to communicate with some of the acoustical people, so that the zoning laws will not allow this kind of thing and we stopped within two acres of it. If we wish to provide bad land use development, it is a travesty; it is just as bad to do this kind of thing as to do the kind of thing we saw. I think there has to be more communication with planners.

I think I heard the first speaker say something about some kind of committee in California that would set up some standards. I told Bob that we would have to tell our people we have to keep our eyes open for this.

Mr. ELDRED. The only way to stop anything like this is through some sort of legal sanction.

Mr. SINGER. It would seem to me, a man being what he is, if it only allows you to build within 25 feet of the highway, there are going to be some people who are going to do this. If you do not want to have this, you change the zoning code and you crank into those codes or regulations those things that will safeguard against that kind of thing. I know the National Association of Homeowners would support that kind of good land claim, as opposed to the thing that you start with a half-acre, to an acre, to 2 acres, to 4 acres to keep development off.

I think we need those kinds of regulations to prevent the impact of highways on residential construction. They could be as meaningful as they had to be.

Dr. MEYER. Thank you very much. It has been a very useful presentation.

I would now like to recognize the fact that noise is an international problem as well as a national one. We can learn much in this country from the efforts of others. I would like to welcome Mr. C. Kenneth Orski, who is head of the Division of Urban Affairs, Environmental Directorate, in Paris.

STATEMENT OF C. KENNETH ORSKI, DIVISION OF
URBAN AFFAIRS, ENVIRONMENTAL DIRECTORATE
OECD, PARIS

Dr. ORSKI. Thank you, Mr. Chairman. Members of the panel, as Dr. Meyer said, I am Kenneth Orski, head of the Division of Urban Affairs, Department of the Environment, in the Organization for Economic Cooperation and Development. I am pleased to have this opportunity to appear before these hearings and to review the results of OECD's work in the field of noise control and abatement, specifically as it relates to the technology and economics of noise emission control.

OECD has been conducting investigations in the field of noise abatement for a number of years as part of its program of international cooperation in the field of environment. The inclusion of noise within the program has been a reflection of the growing belief on the part of OECD member governments that noise, no less than some of the more visible forms of pollution, represents a real threat to the quality of the environment and to the well-being of people. Our activities have ranged over such subjects as airport noise, sonic boom, and most recently, motor vehicles.

It is, of course, no accident that the issue of noise has received the most serious attention in the more urbanized nations of the OECD family. Just as high levels of pollution in the Los Angeles area have caused the State of California to become an early leader in the campaign against air pollution, so have the high decibel ratings in the crowded, densely populated cities of Western Europe made European nations first aware of the necessity to take vigorous steps to combat the noise nuisance. Today, however, the reduction of noise levels in urban areas ranks high on the environmental agenda of almost every OECD government, and these hearings are, of course, very positive proof of this fact.

What are the dimensions of the urban noise problem as seen through the eyes of most of our member governments? Although it would be difficult to document a dramatic rise in noise over the past two decades in terms of sound levels, and even more difficult to estimate the rate at which noise is likely to grow in intensity in the future, there is no doubt that the problem is becoming more serious because of the rapid spread of noise in space and in time. Each year noise invades a growing number of previously quiet neighborhoods, and each year it is heard over a greater proportion of the day and night. In other words, in terms of the total manhours of exposure, the urban noise environment has been deteriorating noticeably.¹

I might add parenthetically that in a noise survey in London, it was shown that the period of calm during the night hours has been reduced—back in the sixties—to approximately 5-6 hours, from midnight to about 5-6 a.m. What is more significant, this period has since grown shorter. A similar phenomenon has

¹ For example, the 1961-62 noise survey in London showed that the period of calm during night hours had been reduced to approximately 5-6 hours: from midnight to 5-6 a.m. What is more, subsequent surveys in London have shown that the period of night calm has since grown shorter. Similar phenomena have been observed in other major European cities.

been observed in other European cities. I believe the same is true of American cities.

Looking at the problem from this standpoint, one is inevitably drawn to the conclusion that the motor vehicle is principally responsible for the situation. While the sources of annoying sound in a city are plentiful, few noises have been extending their influence as rapidly and relentlessly as the noise of motor vehicles. It is the seemingly unending spatial and temporal progression of traffic noise, affecting as it does the lives of an ever growing proportion of the population² for an ever longer number of hours each day and night that distinguishes the problem of traffic noise from most other noise-generating activities. This is also the reason why the motor vehicle has become the primary focus of noise abatement efforts almost everywhere.

Within OECD, the concern about traffic noise has led to the creation of a special task force to develop the guidelines for a model national traffic noise abatement strategy. The recommendations of the task force, recently published in a report "Urban Traffic Noise: Strategy for an Improved Environment," stress the necessity of vehicle noise emission standards and effective enforcement machinery as a prerequisite to any substantial reductions in urban noise levels.

Incidentally, Mr. Chairman, I would like to make this report part of the record, with your permission.

Dr. MEYER. It is so accepted, and it will appear in the transcript following your verbal statements.³

Dr. ORSKI. Such standards, according to the task force, should be made progressively more stringent to reflect advances in noise reduction technology. Recognizing the necessity for basing decisions concerning the level of standards on as rational grounds as possible, the task force recommended that governments support detailed appraisal of alternative noise emission limits.

Such studies, according to the task force, should attempt to: (a) Define present technological capability to meet initial standards; (b) identify technological improvements in engine and vehicle design required to meet a range of more stringent standards, and develop realistic estimates of the research, development and production costs of such improvements; (c) explore how the costs associated with the development of vehicles with reduced noise emission characteristics might be equitably allocated between the taxpayer and the driving public.

Studies within OECD concerning vehicle noise abatement are currently continuing in the context of a major inquiry, "The Impact of the Motor Vehicle on the Environment." The aim of this 2-year project is to carry out a broad technology assessment of the motor vehicle in order to aid member governments in the formulation of comprehensive strategies toward the automobile.

² In the United States, according to one study, the number of people exposed to noise levels of 55 dbA and higher will have quadrupled between 1960 and 1980 ("Transportation Noise Pollution: Control and Abatement," NASA (1970)); in the United Kingdom another study has estimated that the number of people exposed to noise levels of 65-70 dbA and above will grow from 46 to 61 percent of total population between 1970 and 1980 ("A Review of Road Traffic Noise," RRL Report LR 327 (1970)).

³ This material is on file at the Office of Noise Abatement and Control.

I would like to spend the rest of my presentation dealing exclusively with the problems of emissions technology and economics. Preliminary investigations in the context of this inquiry indicate that reductions on the order of 2-3 dbA could be achieved in the fairly short run by adding acoustical absorbers and by detailed attention to mufflers, air intakes and cooler fans. Such incremental improvements would bring down typical noise emission levels of passenger cars to approximately 80 dbA from the typical current levels of 83-83 dbA; and of heavy trucks and tractor trailers to approximately 87-89 dbA from the typical current levels of 90-91 dbA.⁴ I am here talking in terms of the ISO procedures, which measure emissions at 7.5 meters as opposed to 15 meters in the United States. The state-of-the-art reductions coincide closely with the United Kingdom's proposed 1973 noise emission limits for new vehicles: Passenger cars, 80 dbA; trucks (less than 200 hp.), 86 dbA; heavy trucks (more than 200 hp.), 89 dbA.

By contrast, the limits recently agreed to by the Common Market countries approach more closely the emission characteristics of vehicles currently on the road: passenger cars, 82 dbA; trucks (over 3.5 tons), 89 dbA, and heavy trucks (more than 200 hp.), 91 dbA.⁵

According to one recent test, only 4 percent of a sample of approximately 400 trucks failed to meet the limit of 91 dbA; but 26 percent of a sample of approximately 400 passenger cars failed to meet the limit of 82 dbA. A typical U.S. sedan is rated at 84 dbA according to ISO test procedures.

It is also our preliminary conclusion that reductions of 4 decibels or higher are envisageable, but probably only over the longer run since they would seem to require more fundamental changes in the vehicle system. Nevertheless, a British working group has recommended a reduction in noise limits down to 75 dbA for passenger cars and 80 dbA for trucks, these proposed standards to take effect in 1980.⁶

This is the state of actual or proposed legislation concerning vehicle noise emission standards. What is Europe doing to meet these goals?

First of all, there is a research program in the United Kingdom with the objective of developing a quiet—that is, 80 dbA diesel truck. The project is looking at ways of minimizing both body and tire noise as well as engine/exhaust system noise. The program is sponsored by the U.K. Department of the Environment, which has recently come into being, and is expected to run for several years. This is an R&D.

Also worthy of note is another announcement in the United Kingdom by a private company about the design of a diesel engine with noise emission characteristics 4-9 dbA lower than

⁴ Expressed in terms of ISO test procedures, i.e. emissions measured at 7.5 meters (as opposed to 15 meters in the United States), during acceleration in typical city traffic conditions.

⁵ According to one recent test, only 4 percent of a sample of approximately 400 trucks failed to meet the limit of 91 dbA; but 26 percent of a sample of approximately 400 passenger cars failed to meet the limit of 82 dbA. A typical U.S. sedan is rated at 84 dbA according to ISO test procedures.

⁶ "A Review of Road Traffic Noise", RRL report LR 357 (1970).

those of a conventional diesel of the same horsepower. This design is based on work by Professor Priede of the University of Southampton.⁷

In Germany, the firm of Heinrich Gillet, in cooperation with the Universities of Cologne and Essen, is carrying out, under the auspices of the German Engineering Society and the Ministry of Transport, a technical and economic analysis of alternative vehicle designs with reduced noise emission characteristics. The study will probably be completed by the end of 1972.

Finally, in Sweden, Volvo has recently announced the design of a new 320 hp. diesel engine which is 6 dbA quieter than current engines of equal horsepower. The cost of the new engine is estimated to be about 5 percent higher than the cost of the current engine.⁸

As the above brief survey indicates, attention in Europe is principally focused on reducing the noise output of the vehicle system itself, while comparatively little attention is devoted to the problem of tire noise or aerodynamic noise. This is because in the typical European driving conditions the engine/exhaust noise clearly predominates over the latter. A variety of factors are responsible for this: First, the general absence of urban free-ways seldom allows high cruising speeds at which tire noise becomes a significant factor; second, streets in European cities tend to be narrower and lined with uninterrupted building facades, both of which accentuate engine and exhaust noise; third, the typical European car has a low-power (under 2,000 cc.), high-compression engine with a shorter stroke and higher revolutions than its American counterpart; thus, at prevailing city speeds, engine noise tends to mask tire noise to a greater extent than in a U.S. model. Finally, the European style of urban driving (fast accelerations and decelerations) tends to accentuate the already high noise emission characteristics of European automobile engines.

The considerable effort devoted in the United States to the problem of tire noise, which, as I said, is more a U.S. problem than a European problem, makes any further comment here on this aspect of the problem superfluous.

This completes my formal testimony, Mr. Chairman, but I would be very happy to answer any questions from the panel concerning specifically developments in Europe and also our particular approach to the problem of automobile noise within the OECD technology assessment.

Dr. MEYER. The appendixes which are with your prepared statement will also appear immediately following the submission.⁹

Before making any comment or statement, I will ask my colleague on the right, Mr. Eldred, if you have a question.

Mr. ELDRED. As I understand it, many of the European countries have tax laws which encourage lower horsepower engines. I just wonder, looking at this, if you give any consideration to

⁷ Automobile Engineer, October 1971.

⁸ See Appendixes A and B for a summary of motor vehicle noise emission control.

⁹ The appendixes appear at the conclusion of Dr. Orski's testimony.

the size of the engine as being dictated by external constraint. One of the things we note here is that some of the European cars, when operating in the normal mode here, are always operating at the peak horsepower, very close to the maximum noise levels that they have, whereas a typical American car is more or less loafing at the cruising speed and much quieter.

Dr. ORSKI. Yes, undoubtedly the structure of the tax law has encouraged the development and widespread use of low-powered engines. There have been voices raised in Europe against this system of taxation, which encourages not only a high noise but also a greater reliance on leaded gasoline, because the high-compression engines require higher octane and therefore higher lead levels and perhaps higher levels of nitrogen oxide emissions. There have been voices raised for legislation designed for phasing in a lower compression, lower efficiency engines.

However, there are a lot of contravening forces which go against it, one of which is the desire of the European nations to use up as slowly as possible oil reserves. Most of the oil is imported into Europe. Therefore, it presents a drain on their dollar balances. There are all sorts of trade-offs in favor and against the use of high-compression engines.

Dr. JOHNSON. I have two questions. The first one is with regard to the speed limits in central Europe, which are becoming prominent. I wonder whether noise had any part in that, or is this strictly a safety consideration?

Dr. ORSKI. No, sir, that was strictly safety. Accidents have become a real political issue in most European nations. Despite the almost inborne dislike of speed limits that most Europeans have, they have been driven to adopt them now, not just in the cities, but also on the open highways. As far as I know, noise has not been a factor in the decision. It was strictly a safety measure.

Dr. JOHNSON. My other question: Could you tell us something about the organizational structure to carry out this study in setting up standards on noise on the cooperating agencies?

Dr. ORSKI. Obviously, the standard setting is a national prerogative in Europe. Nevertheless, there is an international working group within the Economic Commission for Europe, in Geneva, called working party No. 29, which has for several years now been active in trying to harmonize, as they say, vehicle standards within Europe, not just noise emission standards but also bumpers, headlights, pollution emission, and so on. The conclusions of this working party are not binding on any of the European member states. However, they have been adopted as regards noise emissions almost to the letter by the Common Market countries.

One criticism leveled against the work of that working party No. 29 has been precisely that they are trying to freeze the state of the art; that they are not taking a sufficiently dynamic viewpoint of automobile technology; they are simply trying to perpetuate the existing state of the art.

It is, indeed, true that current automobiles do not meet more stringent noise emissions in Europe than the ones that had been recommended within working party No. 29. However, it has been our feeling that government policy ought to reflect the changing

technologies of noise abatement and that these standards ought to be periodically revised to take into account precisely the evolving state of technology, noise abatement technology.

In addition, as I mentioned in my presentation, Britain has also enacted noise emission standards, and these are more stringent than the standards that have been enacted by the Common Market countries.

Mr. BERLAND. Do I get the inference that European cars may be heading toward lower compression, lower revolutions per minute?

Dr. ORSKI. I do not think this is a warranted inference. A lot depends on how Europe is going to respond to the lead issue. This has become quite the subject of very exciting debate, with some nations in favor of banning or at least severely limiting lead levels, and other nations claiming that there is no scientific proof making it necessary to remove or limit the lead content of gasoline. Presumably, if lead is eliminated from European gasoline, certain manufacturers may wish to lower their compression ratios, but this is part of the market strategy and I could not say which way they are going to go. They may add some aromatics to compensate for the lack of lead. Then they may run into other problems.

Mr. BERLAND. Is there any trend toward the reduction of noise inside the vehicle? This is specifically for automobiles and trucks.

Dr. ORSKI. None that I know of, really, besides the very superficial efforts to improve the quality of materials used inside. I might say that there are certain national differences in the perception of the vehicle noise problem. In some countries, like in Britain, the heavy truck is considered as the major nuisance, not so much a passenger car. In other countries, such as France or Germany, the passenger car is considered almost as much of a nuisance as the truck simply because a very high proportion of people in European countries live in central cities where the traffic of automobiles, the noise of traffic predominates over the noise of trucks.

Mr. BERLAND. In Europe, you have proportionately many more motor scooters, motorcycles, similar two-wheeled vehicles with the engines exposed. I notice you have the regulations here in the United Kingdom and the Common Market, but they do not apply to motorcycles or other two-wheeled vehicles. Are there such?

Dr. ORSKI. There are noise limits for motorcycles and scooters which I had not included in my testimony. I cannot cite the exact decibel ratings, but they are in existence.

Dr. MEYER. Would it be possible to get those at some point, Mr. Orski, to make this record as complete as possible, since we will be using it for some background?

Dr. ORSKI. Yes, we would be very happy to. I will provide this for the record.

Dr. BERANEK. Thank you for this summary. I have no questions.

Mr. MARTIN. No questions.

Dr. MEYER. Thank you very much. We do need to know a great deal about what is going on in the rest of the world around us.

This is going to be a useful document for us to use. I look forward to working with you if we can.

(Dr. Orski's appendixes follow:)

APPENDIX A—THE SOURCES OF NOISE OF MOTOR VEHICLES AND POSSIBLE ACTION FOR CONTROL

Source	Action	Comments
Motorcycles:		
Air intake	Silencer	Available space small. Adverse effect on performance.
Exhaust	Improved silencer	Available space and effect on performance.
Cover vibrations, valve, gearcase, crankcase.	Damping on vibration isolation.	Probably not beneficial unless intake and exhaust first dealt with.
Engine cylinder block	Damping of cooling fins	Comments on cover vibrations apply.
Motorcars:		
Exhaust	Improved silencer	Space not necessarily a problem. Silencer shape can be designed to fit any space available.
Air intake	do	As exhaust.
Cooling fan	Location of fan with respect to obstructions. Aerodynamic blade design. Optimisation of design parameters to limit tip speed. Thermally controlled operation.	Styling of the car front can be important. Also design of grille and air paths to radiator.
Engine cover vibrations	Improved design where necessary, e.g. damping, isolation.	
Tires		Only a problem at high speed.
Engine vibrations. ¹		
Commercial vehicles:²		
Engine	See app. B	See app. B.
Air intake, exhaust, cooling, fan, tires.	As for motor cars	As for motor cars.
Transmission	Shields enclosure, improved structure design.	See app. B.

¹ It is unlikely that engine redesign, shielding or enclosure will be applied to motorcars. The engine is usually well shielded by the engine compartment, but some sound-absorbing material within the engine compartment will be advantageous to minimize reverberations.

² The main source of noise is the engine, secondary sources are exhaust, air intake, fan, tires, and transmission.

APPENDIX B—ENGINE
SUMMARY OF NOISE SOURCES AND METHODS OF CONTROL GIVING POSSIBLE
REDUCTIONS, PROBABLE COSTS AND ATTENDANT PROBLEMS

Method of control	Reduction (dB)	Cost	Comments
Combustion	2 to 3	Nil	Possible effect on emissions and economy of operation.
Turbocharging	2 to 3	Cost of turbocharging unit.	Present difficulties in emission control. Has the advantage of increasing power. Also, for the same power-rated speed can be reduced giving further noise reduction.
Cover design	2 to 5 possible or initially bad designs.	Could increase cost of covers by 100 percent or more, representing 1 to 2 percent of total engine cost.	Research needed on suitable cover design, particularly development of highly damped sandwich materials and vibration isolation techniques.
Shields	2 to 3	Estimated 2 percent of total engine cost.	Requires considerable research and development, particularly on suitable materials and methods of fixing.
Enclosure	Up to 10	Up to 3 percent of total vehicle cost.	Numerous attendant problems—fire, risk, accessibility, weight, difficulty of maintenance, cooling, etc. Has far greater potential in buses.
Operating parameters.	E.g. 6 possible by change from long to short stroke design for same engine output.	Not necessarily affected.	A feature of initial design. Weight, size, torque characteristics, etc., have to be considered.
Structure	Up to 10 considered possible.	Impossible to assess but need not necessarily be greatly increased.	Considerable amount of research and development required. Comments of cover design and shields apply.

Dr. MEYER. Because of the time, we are going to forego the ecology break.

At this point, I would like to ask Mr. Terry Trumbull, who is a member of the senior staff, Institute of Public Administration here in Washington, to come forward.

STATEMENT OF TERRY A. TRUMBULL, SENIOR STAFF,
INSTITUTE OF PUBLIC ADMINISTRATION

Mr. TRUMBULL. Thank you Dr. Meyer. I am Terry Trumbull, on the senior staff of the Institute of Public Administration, which is the oldest nonprofit research institute in the country. I am particularly fortunate in being preceded by Ken Orski, because it is completely accident that our two discussions are going to dovetail into each other. To briefly outline what that means, Ken Orski has discussed the major noise control policy that is redesigning the motor vehicle itself. My thesis, which I will discuss in depth in a moment, is that in some areas there is so much vehicular traffic we are going to have to use other sorts of controls in addition to the major control to redesign the vehicle.

I shall begin. The motor vehicle was designed to meet the transportation needs of people. Unfortunately, this has meant that vehicles tend to concentrate where people concentrate, in the cities. Consequently, there are large numbers of motor vehicles in the cities and these vehicles create significant environmental problems; not the least of these is noise pollution.

Because motor vehicles are the major source of urban noise, my discussion focuses on policies which can reduce motor vehicle noise pollution. The thrust is to identify issues and emphasize what can be done now to prevent future noise from mass use of motor vehicles, as well as identifying needs for implementation of these strategies.

INTRODUCTION

While air pollution caused by motor vehicles is widely viewed as a serious problem to be dealt with immediately, noise pollution is not. This is true despite mounting evidence that noise can have deleterious psychological and physiological effects on human beings. It is also true despite the fact that people normally prefer a quiet to a noisy environment. Currently, they will tolerate a noisy one—but that attitude is changing.

In short, expectations are rising and noise abatement plans must be drawn up to recognize it. Even in areas where noise abatement may not be a serious problem at this time, many preventive measures can most profitably be taken now.

Unquestionably, the major effect of noise due to transportation is aesthetic. It degrades the quality of life—especially in densely populated centers where there is both more noise and more people to hear it. Most of the noise generated in urban centers is traffic noise, as evidenced by a 3-year-long study in Chicago which concluded that: The most prevalent city noise unquestionably is that of traffic. The most prevalent source of noise in industrial areas is also that of traffic. In many cases, the noise in an industrial area is that due to related traffic, such as the motor trucking identified with a particular plant. In residential areas, the so-called unidentifiable background can usually be identified as noise of distant traffic.

Other surveys in other cities draw similar conclusions—traffic noise dominates other urban noises.

While, cumulatively, noise might affect people psychologically and physiologically, its immediate effect is almost entirely subjective—that is, to people who are aware of it, noise is disturbing. Because the effect of noise is subjective, it is difficult to measure that effect. The difficulty is compounded because people are annoyed, not so much by the steady hum or roar of traffic, but by the peak noises which more or less randomly intrude over the background noise. Thus, a relatively few noisy vehicles, such as trucks, motorcycles, or sports cars, disturb people more than the greater number of automobiles which create background noise.

Just as motor vehicles might be designed to reduce the pollutants they emit, so they might be designed to reduce noise. For any given class of vehicles this might include: redesign of the engine, intake and exhaust silencers, brakes, gearboxes, engine enclosures, and fans. Tires might also be redesigned to reduce the noise from tire-roadway interaction. Finally, the aerodynamic design of the vehicle itself might be changed to reduce wind noise. However, to accomplish a meaningful reduction of urban traffic noise, it probably would not be cost effective to redesign every class of vehicle, even if it were practical to do so. Clearly, the ones contributing most of the annoying sounds deserve the more immediate attention.

While the major noise control strategy must be the redesigning of the motor vehicle, this may not be sufficient to reduce noise to tolerable levels in some areas. For example, in spite of the extremely stiff air pollution emission standards for 1975 cars, it is estimated that 60 American cities will have to take additional measures to control cars. Similarly, vehicles may be so concentrated in downtown urban areas that noise reduction policies, other than redesigning motor vehicles, may be required. These policies include: (1) planning metropolitan areas so as to prevent the construction of inadequately protected buildings in zones too noisy for them, and to reduce motor vehicle trips (and thus presumably noise) by providing alternative means of transportation; (2) designing highways and related facilities to minimize vehicular noise through the interaction of the vehicle and the roadbed, and by locating and shielding buildings adjacent to roadways so as to minimize noise; (3) operating streets and highways in order to minimize noise resulting from stop-and-go traffic; and (4) restricting either motorist behavior in order to reduce noise or the vehicle itself to prevent noise in particular parts of the city.

PLANNING

Theoretically at least, a metropolis might be planned to reduce the effects of traffic noise, if not the noise itself, by clustering facilities which are to be served by noisy vehicles—particularly trucks. If these facilities—industrial parks and shopping centers, for example—were set in what amounts to a greenbelt, the resulting traffic noise would affect relatively few people. The trouble is that land surrounding either industrial parks or shopping centers becomes too valuable to be used only for acoustic screening. People seem anxious to move close to noisy activity centers for the sake of convenience. Perhaps they should be protected against their shortsightedness, but this will be costly to do.

Noise control zoning is a way of protecting people against their shortsightedness in much the same way that building codes protect them. Under this concept, specific zones, perhaps with maximum permissible sound levels, might be established to exclude users who would be unduly bothered by the noise in that zone.

ALTERNATIVE TRANSPORTATION MODES

It is unlikely that the provision of alternative transportation facilities represents a feasible way to diminish road traffic noises. It can succeed only if there is sufficient inducement to the user to prevail over the economic or other reasons which caused him to choose a noisier transportation mode.

It is doubtful that subways or other rapid rail transit can reduce auto usage enough to make much difference in the noise levels on our roads. While diverting auto users to mass transit would help reduce background noise levels, it would have little effect on peak noises, such as those created by trucks. In addition, there are some who think that providing rapid rail transit facilities would increase noise levels downtown by encouraging more development and hence more traffic.

ROADWAY

By designing and locating roadways properly, noise generated through their use may be minimized or ameliorated. For example, designing a roadway with smooth rather than rough asphalt surface can reduce noise levels by about 5 dbA. There is a trade-off, however. Smooth asphalt provides less traction and is, therefore, less safe in wet weather.

Another design alternative to ameliorate the effects of roadway noise on the adjacent environment is to put the roadway in cut—or better—a tunnel. This approach, often advanced by urban planners, may not be cost-effective. Granted, the adjacent environment will be quieter, but the trade-off results in both overly expensive road facilities and serious degradation of the environment for all persons using those facilities. The very idea of burying highways runs directly opposite to the concept of beautifying them for the enjoyment of their many users. In any event, narrow cuts and long tunnels concentrate air pollutants and amplify noise, sometimes to the severe discomfort of roadway users. It can be argued that this makes inherently unsafe designs even less safe.

Noise can be minimized by designing roadways with increased width. Streets and highways less than approximately 24 meters wide reverberate and amplify the sounds generated by vehicles using them. For example, sounds generated in a narrow street 6 meters wide will be amplified by over 10 percent. In a street twice that width, 12 meters, sound will be increased by 5 percent.

The increased noise of a narrow street affects the people who use the buildings on the street as well as motorists and the pedestrians who use the street itself. Rather than widening the street by tearing down and replacing the buildings abutting it, modifications may be made to the buildings themselves to protect their occupants from traffic noise. The most cost-effective modification involves the acoustical treatment of existing window openings.

The problem of traffic noise intruding on building occupants might be prevented in the first place by properly locating or shielding the building from the roadway's noise. Inside noise levels can be further reduced by screening the building with other structures. Nonresidential buildings might be located along the roadway to act as sound screens for residential buildings located in back of them. The spaces between the buildings could be planted with trees and shrubs to provide still more acoustical protection.

TRAFFIC FLOW

The most annoying sounds of traffic are generated when vehicles accelerate, decelerate, and stop. One way to reduce traffic noise, therefore, is to eliminate the stop-and-go driving which creates much of it. Street traffic control systems can also reduce pollution by reducing stop-and-go driving. There are a wide variety of techniques which might be used for this purpose. They range from demand-responsive signalization of intersections to grade separations of pedestrians and vehicles. Most of these techniques are familiar to traffic engineers who would apply them all—if money were available to do so.

There are two major problems in controlling noise with these systems. First, increasing traffic speed beyond 35 miles per hour is counterproductive in terms of noise abatement. Second, traffic seems to be so great in some areas of our cities, such as the central business districts, that it practically overwhelms whatever improvements can be made in traffic flow. In these situations, only outright traffic bans or other restrictions on demand are likely to work.

TRAFFIC BANS

A good deal of noise due to transportation can be abated by requiring few, if any, physical changes in either the vehicle or the facilities it uses. Instead, changes may be required in how motorists behave and where vehicles are used.

Certain prohibitions can, of course, be imposed directly on behavior affecting traffic noise. Some of these—like slamming car doors at night—are difficult to enforce and must necessarily depend on what amounts to voluntary cooperation. Others are simple to enforce and have been quite successful. For example, in many cities throughout the world, hornblowing has been made illegal except in cases of imminent danger. The resulting difference to the environment is remarkable and most welcome in previously noisy cities, like Paris, Vienna, and New York.

RESTRICTIONS: NOISE PROHIBITIONS

Completely banning traffic from certain parts of the city will almost by definition reduce motor vehicle noise. However, partial traffic bans such as those applied in Gothenburg, Sweden, do not help the noise environment very much. General background noise may have been reduced, but to the extent that trucks, motorcycles, and buses use restricted streets, the background is pierced with annoying sounds. If anything, these intrusions might seem even more annoying against a lowered background noise level.

CONCLUSIONS

This paper has focused on policies which result in the reduction of noise from motor vehicles because they are the major

source of urban noise pollution. However, it is important to remember that motor vehicles strongly affect the environment in other ways, particularly in the form of air pollution. Each policy discussed here must be studied in the context of a broader environmental approach, but unfortunately little has been done in synthesizing the effects on different aspects of the environment. We must develop transportation policies which optimize the control of both air and noise pollution, as well as other social factors.

Furthermore, much has been said about the noise reduction potential of various transportation policies, but little has been said about their costs and economic feasibility. We must develop a cost analysis of the various motor vehicle noise reduction strategies so that we know what their effect will be and at what cost. In addition, little consideration has been given to the institutional difficulties in implementing these strategies. We need to know the economic, social, legal, and political impediments to each policy and the resulting consequences. These sorts of questions need to be answered and the answers are quite important because our ability to control the noise in our environment depends upon their resolution.

Dr. MEYER. Thank you very much, sir, for laying out a lot of problems for us. Before asking the panel if they have comments or questions, let me make an observation and ask you a question. In listening to your paper and following it along, I got the impression that your institute seems to feel that some sort of inner city, crowded area, alternative transportation mode is indicated because of the fact there is not enough space in which to pack all the vehicles. The fact remains that some of the alternative methods of transportation also may be sources of noise or other kinds of pollution.

I saw something the other day that highlights this problem in one of Mayor Wise's neighboring cities, Shreveport, La., my home town. In 1950, the Shreveport Railway Transit Co. was operating trolleys in a city for 20 million passengers a year. In 1970, the company is about to be bought by the city because it carried less than 1 million passengers.

Have you any thoughts on how we get at that particular problem? I guess the crux of the question is how are you going to move thousands of the people into the center of the city and out again in an economical, effective, rapid and nonpolluting way?

Mr. TRUMBULL. I wish I had some good quick solutions to that but I guess they would have been long since implemented, mass transportation has had enormous problems because of consumer preferences, and the automobile has provided an enormous convenience. I think one difficulty is that there really has not been much consideration of new transportation modes that have developed. Transportation has been doing quite a bit recently, but we are still basically using the same things; namely, subways and buses.

One concept that we have worked on is called a taxibus, which is essentially a cross between the two, which utilizes computers to a large extent, which allows seven or eight people to be

carried together. By utilizing computers, each one is picked up at his door like a taxi, so it can be delivered quite rapidly, at the same speed you would in a taxi; but there have been numerous impediments here, not the least of which has been the Federal Communication Commission. They have a 6 month restriction on the amount of experimental use for the airwaves, and the cost of a computer is still well above what could be justified over a 6-month period.

There are all sorts of different transportation innovations of this nature which could reduce both noise and air pollution problems, and I think probably have a significantly more pronounced impact on our transportation problems, in addition.

Mr. WISE. I have the answer on the transit problem for the whole Nation. It is real simple. It is just that mass rapid transportation has to be so clean, so convenient, so economical, so fast, that a person has no choice but to take it in preference to his automobile. When somebody comes up with that kind of transportation, that I can step right outside my front door and walk a maximum of one half-block to the corner and catch that rapid transit and be dropped right at the corner of city hall, then I will take the rapid transit, and not until then. Really, I owe it to the taxpayers, for whatever time I save in the automobile, to give them that time. Nobody has come up with that.

One other thing: In Dallas, we did take over the transit system and we did change from rail to gasoline bus transportation. One of the major reasons was because people were complaining about the noise of the streetcars, but now they are complaining about the air pollution from the gasoline bus, so you have two pollution factors here. It really depends on whether you prefer noise or air pollution, that is what it really amounts to.

Dr. MEYER. As usual, Mayor Wise, you have summarized the situation very neatly.

Dr. JOHNSON. I could not help but think about the area surrounding Times Square in New York City, say, within eight blocks in any direction. Do you have any proposed systems for traffic flow in that area?

Mr. TRUMBULL. I must confess that is not an area I am terribly familiar with. There are a great number of devices which can be used to speed up traffic. I think that in New York to a large extent they have utilized them about as much as possible. They have an enormous problem with over 80 percent of the traffic on the street during the day as trucks or taxis, particularly the trucks, with the amount of double parking which is done in New York. There is not any way that traffic engineering can prevent that sort of a problem.

I think the downtown city congestion, the limits imposed by the building, make it very amenable to noise control. You cannot get very many more sources down there, and you can figure out how much noise reduction you want, and that is one beautiful place to get it.

Dr. MEYER. Thank you, Mr. Trumbull. The thought has occurred to me, why not get some more information on it. I am wondering about studies on the buildup of carbon monoxide in heavily traveled areas and through-cuts. There is a tremendous

problem in tunnels. Studies on policemen have shown excessive carbon monoxide levels. I am glad you have brought this up. Thank you very much.

At this point I would like to ask Mr. Ray Leonard, of the U.S. Forest Service, if he would come forward and give his paper about the role of trees and shrubs in noise control.

**STATEMENT OF RAYMOND LEONARD, U.S. FOREST
SERVICE, SYRACUSE, N.Y.**

Mr. LEONARD. Increasing population density and heavy dependence on mechanical devices has resulted in a relatively noisy environment. This condition leads us to a reassessment of some of the natural features of our landscape in an attempt to alleviate a portion of the discomfort resulting from our technology.

The role of trees and shrubs as a possible solution to some of our noise problems has been considered. Can vegetation serve a role in reducing noise?

This question cannot be answered simply. Too many factors affect the propagation of sound through vegetation. For example, the relative position of sound source and receiver will effect the value of the vegetation as a sound barrier. Where the sound source is above the canopy, as with aircraft, the amount of sound abatement by the vegetation will not be as great as if the sound source was at the same level as the receiver.

The size of the trees and the density of the lower shrubs also affect the value of the vegetation as a sound barrier, because sound travels in waves and wave length of sound may be large relative to the size of individual trees or shrubs.

In addition to size, density, and relative position of the vegetation, sound propagation is modified by wind, temperature, and terrain.

Transmission of sound through the atmosphere is dependent in part on the meteorological variables wind and temperature. Trees and shrubs may serve to moderate wind and temperature and in this way reduce the influence of these two factors on the transmission of sound. This may be particularly important in creating shadow zones to diminish sound transmission adjacent to windy areas, such as busy highways and airports.

Another aspect of vegetation in noisy areas is the visible screening effect. In some cases, it has been noted that when a noise source is obscured from view its nuisance level diminishes. The aesthetic and psychological role of vegetation in noise abatement may be one of the more important roles that this material may have.

Although the role of trees and shrubs in reducing noise is often misinterpreted due to the many myths and half-truths often put forth in the popular literature, vegetation can play an important part in any consideration of decreasing noise levels if correctly used.

The U.S. Department of Agriculture Forest Service at its Northeastern Forest Experiment Station headquartered in Upper Darby, Pa., has been conducting research in noise abatement by vegetation since 1968.

This modest early effort has recently been enhanced by the addition of a research project devoted to amenities derived from trees. In this research project, intensive efforts will be devoted to the study of the role of trees and shrubs in noise abatement. Research now underway or scheduled to begin shortly includes:

(1) Analysis of sound attenuation by trees and shrubs, (2) survey of noise levels and frequencies common to urban area; and (3) efforts of meteorological conditions on sound propagation in urban areas.

Also presently underway are sponsored research projects in noise abatement by trees and shrubs at the University of Nebraska and the State University of New York.

Results from this research effort indicate that trees and shrubs absorb 6 to 8 dbA per 100 feet. Information from these studies also indicates that the type of vegetation as well as its placement will be important in considering the use of vegetation as a sound absorbing material.

In one study involving both conifer and deciduous trees in which a sound source of known frequency was propagated through the vegetation, it was found that the dense conifer trees had the greater absorbing capacity. Frequencies in the 400 to 700 hertz range were absorbed more than the lower frequencies. Also indicated in this and other studies was the importance of vegetation location relative to sound source. Rows of trees at right angles to the sound source proved to be more efficient in terms of sound attenuation.

In properly assessing the role of vegetation in noise abatement, the following items should be considered:

1. The use of vegetation in noise abatement involves several considerations. Each case should be considered separately. For instance, a relatively narrow belt of moderately tall trees, which should be adequate screening for some street noise in an urban-residential area, might be ineffective in rural areas where large trucks are traveling at high speeds.

2. A combination of low shrubs adjacent to the noise source backed up with a few rows of tall trees may be more effective than a single group of either trees or shrubs.

3. The noise source, surface conditions, and vegetative plantings, should be considered in total to arrive at the best combination of placement and density of plant material for noise abatement.

4. Often the senses of sight and sound tend to reinforce one another. If the source of sound is not visible, the sound may not seem as harsh to the ear. Trees and shrubs may reduce the sound level somewhat and at the same time screen the sound source from view.

In summary, it is important to make a realistic assessment of the role of trees and shrubs in noise abatement. As a barrier to screen out unwanted sounds they will absorb some noise, modify the climatic variables important in sound propagation, and have a psychological effect on the people exposed to undesirable noise levels.

Although the absorbing capacity of trees and shrubs may appear to be a rather small reduction in noise levels of 6 to 8

dbA, it may make a difference between a livable environment and one that is extremely unpleasant. At sound levels of 60 to 80 dbA, which are the usual levels for street sounds, groves of trees may make the difference between unpleasant street noise and relatively pleasant urban living.

Trees and shrubs will not serve as a panacea for all of our noise problems. However, they do have a definite role to play if used correctly.

Dr. MEYER. Mr. Leonard, thank you. As you know, there has been some controversy about the efficacy of trees and shrubs as sound reducing barriers. I am pleased to note that the Department of Agriculture's Forest Service is actually undertaking this work. We heard some words about this when we were in Denver from the University of Nebraska people, and together with that testimony this is going to be very helpful.

Dr. BERANEK. I hope you find a way of quantifying this aesthetic effect, which probably is a factor, but I do not know how to rate it.

Mr. LEONARD. I do not think many of us do. Trees and shrubs are wonderful; they do everything. But this is an important aspect, this screening effect.

Dr. MEYER. Thank you very much, sir.

At this point I should like to ask Mr. C. A. Wold, corporate noise control consultant, of the Boise Cascade Corp., if he will come forward.

**STATEMENT OF MR. C. A. WOLD, CORPORATE NOISE
CONTROL CONSULTANT, CORPORATE SAFETY
DEPARTMENT, BOISE CASCADE CORP., BOISE, IDAHO**

Mr. WOLD. My name is C. A. Wold, and I am employed by Boise Cascade as corporate noise control consultant, working out of the corporate safety headquarters in Boise, Idaho.

For nearly 18 years I have been concerned with noise abatement as a result of my research and development activities in acoustics and noise control; however, for the past 2 years I have been actively engaged in practical engineering applications of this knowledge by developing noise control programs for many of our approximately 350 manufacturing operations.

My prime responsibility is to provide the acoustical engineering service required to satisfy the requirements of the noise abatement portions of the "Occupational Safety and Health Act (OSHA)." This service includes effort to:

- (1) Determine the sources of hazardous noise as defined by OSHA and also the work positions exposed thereto.
- (2) Determine the most practical methods that are technically and economically feasible to reduce or contain the noise to within specified limits.
- (3) Develop plans with engineering and management personnel as to design, materials and construction of sound abatement devices, and/or other ways to engineer the noise to acceptable levels.
- (4) Provide professional acoustical engineering expertise and help managers draft acceptable noise control programs and assist in their implementation.

(5) Advise managers regarding suppliers of materials or parts necessary and assist them with specifications and budgets for noise control compliance expenditures.

(6) Adopt plans and arrangements whereby the facilities of various manufacturers of equipment used in our operations can be utilized to design and develop noise control features directly into the manufactured item.

(7) Provide up-to-date and accurate information pertaining to audiometric testing requirements as well as information relative to carrying on an effective hearing conservation program.

(8) Promote industrial noise control as a vital need in preplanning and design and engineering prior to construction of new or remodeled manufacturing operations and specifications for field equipment for construction and logging activities.

(9) Keep informed of proposed Federal and/or State legislation relating to noise control and hearing conservation requirements.

(10) Participate, where feasible, in various organizations, trade associations, and technical societies that have standard setting capabilities so that proposed new standards will reflect the realistic needs and concerns of industry.

With the above in mind, my statement and views will deal basically with industrial noise control since this is my prime area of concern.

Noise, as we look at it today, represents an enemy; an enemy because it endangers many facets of our nationwide operations. Noise can be harmful, not only to people directly involved, but it may also create harmful situations that could lead to serious consequences. Therefore, because noise is an enemy, we must learn all we can about it so we can arm ourselves with the proper weaponry to fight it and subdue it. This, at times, is not an easy task since noise, especially industrial noise, is very unpredictable due to the complexity of its nature.

Most industries, I believe, first became actively aware of noise control because of Walsh-Healy regulations and more recently by OSHA implications. No doubt it was something of a shock to be told that the noise levels were excessive and therefore something must be done to reduce them, either by engineering or administrative controls.

The governing criterion that told the story was a term called dbA. The dbA value, as far as practical noise control goes, does nothing other than to indicate that a problem exists or only that in fact a certain work area has a higher or lower noise level than another area. Laboratory data in psychoacoustics and field experience have shown that the frequency characteristics of the noise are of primary importance. Thus, any description of industrial noise should include a specification of the sound pressure levels in octave bands. When the noise exhibits appreciable fluctuations, a single number such as dbA does not provide an adequate description of the noise. A time weighted exposure analysis is also needed to be used in conjunction with a suitable number of data points so that an accurate identity can be made of the severity of the problem.

I cannot emphasize enough that the dbA value alone cannot be used to properly determine what noise control methods should

be applied. To repeat, while the dbA single value measurement usually indicates whether or not there is need for noise control or noise reduction, it does not provide significant information as to the exact cause of the noise problem.

Industrial noise is very complex since the noise made by a single operation may be composed of sounds of many frequencies varying in intensity. Octave band analysis and frequency analysis give the answer to which bands and which frequencies are most offensive. It is vitally necessary to know how the noise energy, from any given noise source, is distributed over a normal hearing frequency range. It is important for at least two reasons: (1) Because people hear and react differently to high frequency sounds than they do to low frequency sounds; and (2) noise reduction treatments are designed differently for high and low frequency sounds. Another plus feature of octave band analysis is that it provides, under most circumstances, the identification of the major noise source within an area having multiple noise sources. In any noise control problem it is most important to find the primary sound source, and attack it first, since many times you will find that reduction of the major sound sources will materially improve the other areas and therefore they will require less treatment.

Noise control treatment may include: Redesign of the source, alternative methods of operation, vibration isolation, enclosures to contain the noise, barriers to deflect the noise, man-enclosures to protect against noise, vibration damping techniques, mufflers for air inlets and exhausts, acoustically lined passages for material flow and personnel movement, sound absorption treatment on interior surfaces, or suitable relocation of sound sources to other areas.

My methods approach to noise control includes the practical application of scrap or waste material available, within a given manufacturing operation, in conjunction with locally available materials. The cost of treatment is thereby reduced by using this means. As a result of this type of effort, the total cost for noise abatement in one of our plants was only \$1,500, compared with a projected cost of \$18,000 as per a quote from one outside consultant firm. Another plant was brought into compliance for around \$250. My specialized design configurations, based on complete knowledge of the noise, can reduce the normally expected cost by about two-thirds.

In some instances, it is necessary as well as practical to fully enclose a noise source. This area of full enclosures is where I depart from conventional and contemporary thought on how an enclosure should be built. Most people believe that enclosures have to be massively constructed, utilize double-stud construction, contain 3 to 6 inches of insulation, and all doors built like refrigerator doors with associated heavy locking devices. Now, if you do not care about how much money you have to spend, the conventional way is all right and eventually you can achieve the desired results.

You see, most existing enclosures have been built around design information that pertains to architectural acoustics (apartments, hotels, motels, public buildings, and et cetera), which

involve expensive and massive construction necessary to fully isolate one room or area from the next. Walls of this type generally provide a sound transmission loss (STL) of about 45 to 55 dbA and are rated by a sound transmission class (STC) number which relates to the STL over a wide frequency range.

My technical approach is to analyze the octave band data to determine which frequency spectrum is causing or contributing the most to the overall noise level and then design a wall (or enclosure) configuration that will effectively reduce those particular major noise components. In most instances, all that is necessary is to provide for a reduction in noise level of about 10-20 db, and then only in specific frequency ranges.

In summation, I would like to set forth some of my thoughts pertaining to effectively achieving the desired degree of acoustical correction:

(1) In most industrial plants the noise field affecting personnel in any given area is the sum of a multitude of individual noise sources; therefore, in general, final reduction to the desired level at any one point may not be obtained until all noise sources within the area are also acoustically treated.

(2) The complexity of diversified operations and the various types and kinds of machinery (within a given plant) at times tend to exhibit wide fluctuations in noise levels depending upon the speed of operation, type of product, et cetera; therefore, efforts must be made to determine maximum noise producing manufacturing conditions so that the design configuration of acoustical corrective devices will allow for adequate noise control at all times.

(3) I have suggested to each plant in question that a systematic approach be taken to reduce the noise levels. This is what I call my "phase concept." By this I meant that after a comprehensive sound survey and octave band analysis have been taken of each area, the major noise sources contributing to the overall noise level are selected for correction first. The results of this initial work (which is the most important step) then determine additional steps to effectively and efficiently arrive at the desired overall result.

(4) Since it is a well-known and accepted fact that high frequencies are the most damaging to hearing, initial steps in acoustical correction should be geared to substantially reducing the high frequency components to well below damaging levels. Subsequent efforts can then be initiated to further reduce the remaining low frequency components which still add to the overall dbA value.

(5) Through the use of octave band analysis and accepted damage risk criteria for hearing loss, I am attempting to show that if the dbA value (after treatment) still is somewhat in excess over that required for a given exposure time, the frequency composition of such a level may indicate that hearing loss would not result due to continued exposure.

(6) If it is assumed that the major emphasis with respect to noise abatement is on the protection of the employees' hearing, then sincere efforts to accomplish effective noise control can be characterized by:

(a) Consistent and continuing programs of noise abatement being carried out through the "phase concept" approach.

(b) Utilization of adequate and proper personal hearing protection devices coupled with a reliable and accurate continuing hearing conservation program during the time needed to complete the acoustical correction and/or until such time that the excessive noise had been reduced to acceptable limits.

(7) It is my opinion that any future standards being developed that will set forth requirements and regulations for the reduction of industrial noise related hearing impairment should include realistic and technically feasible parameters whereby the frequency spectrum of the noise in question can be accurately described in terms of potential hearing loss.

That is my statement.

Dr. MEYER. Thank you very much, Mr. Wold. Although your paper is aimed primarily at industrial noise, some of the points you raise are certainly applicable to the total community in the environmental problem. I am particularly appreciative of your comments and cautions regarding the central single number associated with dbA measurements. We are well aware of the fact that our panel is composed of a group of experts in various areas and your paper may provoke some rather intense questions.

We are supposed to vacate this room at 5 o'clock, but I expect we can go a minute or two over that. I ask the panelists to limit themselves to one question apiece down and back. I am glad to get your views.

As I said, I am particularly appreciative. The panel may not agree with me either, but I do have some real reservations about everybody picking up and using dbA without recognizing some of the limitations for exquisite and exotic technical applications.

Mr. ELDRED. I will defer to the clock.

Dr. JOHNSON. I think the record should point out that while we have been dealing with those aspects of noise control today that one can hopefully put in the form of codes and be regulated, it follows thereby that this gentleman has pointed out that it is more than codes, sometimes, which go to good noise control, and that is to apply methods which you can afford, since you do have noise control. As you indicate, Mr. Chairman, he is addressing himself primarily to those aspects of noise control which protect the people from damage. They are also applicable to comfort; that is, quality of life.

I believe we should point out for the record that there may be applications in noise control which cannot be easily governed by regulatory means, such as codes.

Mr. BERLAND. I want to be sure I understand what you are saying about the dbA. You are saying that in terms of analysis of the situation, for purposes of correction, the dbA is not sufficient. However, you do believe that dbA, in terms of recognizing that there is a problem and in terms of monitoring a problem that you know exists, and in terms of being written into the law for such purposes as we have heard today, such as traffic noises, et cetera—

Mr. WOLD. To me, the dbA is like a speedometer. It lets you know when you are going over the limit.

Dr. MEYER. Would you carry that analogy further and say you really want to know how the vehicle is operating?

Mr. WOLD. That is correct.

Dr. BERANEK. I agree that one needs more than a dbA to analyze the problem that you have in terms of what part of the machine is making the noise, what part you want to treat and things of this kind. I gained the impression that you may have some experience or information that would indicate you could do a better job of predicting how many people in your plant, what percentage of the people in your plant might suffer from hearing damage if you use octave bands instead of dbA. If you have evidence on that, it is quite important.

Mr. WOLD. The only thing I am doing is accepting the Government's regulation of 90 dbA as being the criterion to determine whether or not you do institute noise control corrective measures, and then have them going back through some yearbooks and a lot of other books on damage criteria.

Boise Cascade is a diversified corporation. We have many types of manufacturing operations. In the lumber industry we have a planer that will sing at the tune of 112 and 114 dbA, and when you break that down to an octave band you will find it is 2,000, 4,000 in that particular bands. This constitutes a very definite risk to hearing.

In our paper operations, for instance, we have a lumber paper machine where there is a lot of rumble and roar that is down around the 31.5 cycle—63—in those bands, that are very high in the lower frequencies—but down around 65, 70 db in the higher frequencies. I assume, therefore, based on this type of information, that the people who are subjected to the paper mill noise, as opposed to the planer noise, would be less susceptible to getting hearing loss because of the frequency characteristics of the noise involved.

Dr. BERANEK. I understand you. I agree with you.

Mr. WOLD. As far as having any written documents to prove this, no. I would hope to in time to come. I have a lot of area to cover, and I am trying to do what I can on a priority basis.

Mr. BERLAND. I understand—tell me if I understand correctly—from your comments, as I interpret them in terms of your own role with the corporation, that either you would not have a job or you would not be as concerned as you are with noise control in these plants if it were not for the Federal Occupational and Safety Health Control Act?

Mr. WOLD. I have been concerned with it over a good number of years, and on many occasions I have tried with the companies I have worked with to institute programs; but I agree, it has not been up until the time that Walsh Healy came into existence that there was enough pressure put to bear on industry, not only in my company, that things should be done, and it has opened up a remarkable door for means.

I tried in the past to accomplish a lot of things. I think a lot of people in industry have attempted to do things, but there have always been a lot of outside considerations, costs, but now I think the shoe is on the other foot and things have to be done.

Mr. BERLAND. Now that there is a law saying you have to do this?

Mr. WOLD. That is right.

Dr. MEYER. There being no further questions, this particular session of this hearing is completed. We stay in recess until 9 o'clock tomorrow morning, at which time we will promptly get underway with witnesses.

We will begin with representatives of the Motorcycle Industry Council, and go on to hear from a large group of industrial and civil interest groups.

We hereby stand recessed.

Whereupon, at 4:45 p.m., the hearing was recessed, to reconvene at 9 a.m., November 10, 1971.)

ENVIRONMENTAL PROTECTION AGENCY

PUBLIC HEARING ON THE TECHNOLOGY AND ECONOMICS OF NOISE CONTROL; AND NATIONAL PROGRAMS AND THEIR RELATIONS WITH STATE AND LOCAL PROGRAMS

WEDNESDAY, NOVEMBER 10, 1971

The hearing was reconvened, pursuant to recess, at 9 a.m., Dr. Alvin F. Meyer, Jr., Director, Office of Noise Abatement and Control, Environmental Protection Agency, presiding as chairman.

PANEL:

Theodore Berland, Citizens Against Noise
Dr. John Johnson, Acoustical Society of America
Kenneth Eldred, Wyle Laboratories
Dr. Richard Bolt, Bolt, Beranek & Newman
Mayor Wes Wise, Dallas, Tex.

Dr. MEYER. I hereby call to order the second sitting of the Environmental Protection Agency's public hearings on noise being held in Washington, D.C., under the authority given to the Administrator, Mr. William D. Ruckelshaus, by the Congress under Public Law 91-604, the clean air act amendments of 1970.

I am Dr. Alvin Meyer, the Director of the Office of Noise Abatement and Control of the Environmental Protection Agency, and I am assisted today by a panel of highly qualified, imminent persons concerned with noise, acoustics, and political science. I will introduce the panel, and then again reiterate the information I gave yesterday as to how these hearings are conducted.

The members of the panel are Mr. Theodore Berland, president of the organization Citizens Against Noise, and author of the book "The Fight for Quiet"; Dr. John Johnson, president of the Acoustical Society of America, and distinguished worker in this field; Mr. Kenneth Eldred, acoustical engineer, with Wyle Laboratories of Los Angeles, Calif.; Mr. Henry Martin, the Society of Automotive Engineers of New York City, and a longtime worker in this field; Dr. Richard Bolt, professor at the Massachusetts Institute of Technology, chairman of the board, firm of Bolt,

Beranek & Newman, an internationally known acoustical firm. Later this morning, we will be joined by the Honorable West Wise, mayor of the city of Dallas, Tex.

These hearings, as I have mentioned before, are held for the purpose of obtaining information for the Environmental Protection Agency to utilize in its report to Congress and to the President, called for by the act which I cited, and to provide information to the Congress through the means of the printed transcript of supporting material relating to problems associated with noise and what may be done about them. The information is also going to be utilized by the Agency in structuring its plans for the implementation of legislation relating to noise control now pending in the Congress.

The panel serves, then, as a medium for obtaining information by providing the questions which need to be addressed to the subject matter. They will assist us later by providing additional recommendations which will be incorporated in the material furnished to the Congress. So, in effect, what is said here in these hearings is also being said to the Executive Office of the President and to the U.S. Congress.

We operate, as some of you who have attended these hearings before know, in accordance with the general rules of the Committee on Government Operations of the House of Representatives of the U.S. Congress, which in effect provide that there be no questions from the floor. The panel are the only ones authorized or entitled to question a witness. However, in the interests of fairness, if there are some questions which arise, please hand them in writing to a member of the staff. I will entertain the question, and if it is a general one, we will indeed pass it on to the witness or will arrange for the question to be answered appropriately. Since we have some members of the press either here or who have indicated that they will be here, I would appreciate it if those witnesses who have not done so would provide the staff with copies of their prepared statements so that the press may have them available to utilize in their coverage of this event.

I will remind the panel and the witnesses that we have to vacate these premises promptly at 5 p.m., so with a long list of witnesses, we will have to move ahead very precisely and promptly.

Without further ado, then, I should like to ask Messrs. Hale and Presnell, Mr. Chet Hale and Lance Presnell, of the Motorcycle Industry Council, to come forward and join us at the table in front here, and give us their presentations.

Good morning. I see you did not bring any motorcycles with you as others in your organization did in Denver.

STATEMENT OF CHET HALE AND LANCE PRESNELL, MOTORCYCLE INDUSTRY COUNCIL

Mr. HALE. Mr. Chairman, members of the panel, my name is Chet Hale from American Honda Motor Co. and I have with me, Mr. Lance Presnell, from Harley-Davidson Motor Co.

We are here as technical representatives of the Motorcycle Industry Council.

The Motorcycle Industry Council presented testimony at the recent hearing held in San Francisco and we therefore have no

prepared statement to deliver today. We would be glad to try to answer any technical questions which you may have at this time.

Dr. MEYER. Well, fine.

Let me, for the benefit of the record, since your statement does appear in the verbatim transcript of that hearing, let me capsule momentarily for the panel and the members of the audience, the Motorcycle Industry Council has indeed adopted a rather broad range and aggressive program to attempt to deal with their recognition of noise as a major impact on their industry. We have received rather indepth, technical information from the Motorcycle Industry Council, and also some of their regional activities. We have had presented to us the types of equipment which the industry feels that it can reasonably use for control and we have also received, much to the industry's credit, some information from their regional organizations regarding policies about working on motorcycles and similar vehicles such as motorbikes, which have been altered so that the sound suppression characteristics are not according to specifications. They insist that the owner allow them to bring them back to specifications before they work on them.

I am sure there are some technical questions which the members of the panel might want to ask, or if not technical at least policy questions, so I will start off on my right with Mr. Berland and see if he has anything he would like to ask.

Mr. BERLAND. I wasn't in Denver but let me ask the most basic question, that is, why are motorcycles so noisy, why aren't you making them quieter?

Mr. HALE. We are making considerable efforts to reduce the noise level of production motorcycles, and we are now meeting all of the regulations which are in effect and attempting to meet all regulations which we know are being proposed for the future. We feel that the primary problem with motorcycle noise on the public streets and highways is modified machines.

Mr. BERLAND. Modified by whom?

Mr. HALE. Modified by the owners.

Mr. BERLAND. I don't know. I have heard I should say a lot of motorcycles driven right out of stores, at demonstrations, they are awfully noisy.

Are you really saying that the industry or manufacturers separately and discretely will respond only if there is a law to regulate it such as the law in Chicago which is not going to require you to sell quieter motorcycles over the next 8 years? Is that what you are saying?

Mr. HALE. No, sir, I am not necessarily saying that, I am saying that the industry does feel a responsibility to produce quiet vehicles which are acceptable to the public, and we feel that the motorcycles which are delivered as produced have acceptable noise levels.

Mr. BERLAND. Could you tell me what you mean by "acceptable"?

Mr. HALE. Well, really I don't understand what you mean by "unacceptable," or "objectionable." I think we have perhaps a difference in opinion on just what we are talking about.

Mr. BERLAND. Tell me what you mean by "acceptable" in terms of decibel level?

Mr. HALE. It would depend on what test procedure your are talking about.

Mr. BERLAND. Give me a deviate of 50 feet.

Mr. HALE. What kind of operating procedure?

Mr. BERLAND. Right down the city street.

Dr. MEYER. I can't understand what you mean by that.

Mr. BERLAND. Give me some parameters that you can understand.

Mr. HALE. Did you want to establish some speed, cruising speed, for example, 40 miles per hour, cruising down the street?

Mr. BERLAND. Let's take 30, I will make it easy on you, which is more typical in the city of Chicago.

Mr. HALE. At 50 feet, cruising, I would say at 30 miles per hour, probably they would be in the range of 70 to 74 or 75 dbA.

Mr. BERLAND. I wouldn't guess that low.

Would your companion, who is from another company, care to comment?

Mr. PRESNELL. Yes, we have just recently run a series of tests and I think these tests would bear out this point, that levels considerably less than 80 decibels on a 30 to 40 mile-per-hour cruise is very common.

Mr. BERLAND. Could you specify the models so we could have them for the record?

Mr. PRESNELL. There are quite a number of models, almost a sampling of the entire industry.

Mr. BERLAND. These are produced as of when, the 1972 models?

Mr. PRESNELL. Presently produced motorcycles.

Mr. HALE. 1970 and 1971 models.

Mr. BERLAND. I would like to go back, if I may, Mr. Chairman—I would like to go back to your comment about modification by owners. Can you tell me what these modifications are and how they are made? Or how easily they are made?

Mr. PRESNELL. Well, by its very nature, a motorcycle exhaust is very simple to modify because it is completely exposed. You don't have to crawl underneath a car or do anything unusual, it just takes a few handtools and it can be very easily removed. There are a number of accessory manufacturers that sell so-called racing exhaust systems and various modified devices that can be attached to exhaust systems to make noise. These are in quite large demand by the riders. Unfortunately these devices are being sold and continue to be sold. And the psychological makeup of a good percentage of motorcycle riders demands that they do want recognition and they attach these noisemaking devices, therefor.

Mr. BERLAND. Is Harley-Davidson—do they make any of these devices, accessories?

Mr. PRESNELL. We make no noisemaking devices as accessories. We do sell racing motorcycles and some of the exhaust systems on these motorcycles could be put on standard production motorcycles.

Mr. BERLAND. How about Hondas?

Mr. HALE. No, we do not.

Mr. BERLAND. You don't make any straight exhaust?

Mr. HALE. No.

Mr. BERLAND. Are you doing anything about covering the engine? Are you speaking about exhaust systems in terms of sonically isolating the engines in terms of mounting or covering them, to pull back the noise level?

Mr. HALE. The engine mechanical noise I would say is not a significant source. Primarily exhaust and intake noise are what we are concerned about in attempting to reduce. If we made reductions in engine mechanical noise it would not make any appreciable reduction in the overall noise level of the vehicle.

Mr. BERLAND. It sounds simple, all we have to do is put a lock on the exhaust system as they come out of the factory.

Mr. HALE. We are in fact welding the mufflers on to the exhaust pipe in an effort to discourage merely removing the standard muffler and buying some accessory which will create additional noise. Or increase the noise level. We also have a label on the muffler which informs the owner that any modification to the system would probably increase noise and decrease the performance of the machine in an effort to discourage them from making modifications.

Mr. BERLAND. Maybe we need labels akin to which we have on cigarette packages, operation of this vehicle in excess of 85 decibels for more than 8 hours is hazardous to your hearing.

Thank you.

Dr. MEYER. Mr. Eldred?

Mr. ELDRED. It has always seemed to me that the motorcycle is a classic case of where the market conditions fail to protect the public, and the industry is faced with an actual market demand for noise, from at least one segment of its market. I was interested to hear your welding of mufflers.

What is roughly the pressure drop that you get on the two- and four-cycle engine through the decrement or improvement in performance, on a properly designed muffler? Just as a typical value.

Mr. PRESNELL. I would have to guess, to answer that question. I guess I would rather not. I have some rough ideas of inches of water pressure drop, but not very precise.

Mr. ELDRED. Is it in the order of a few percent loss?

Mr. PRESNELL. Are you speaking of percentage loss powerwise, or pressure drop in the exhaust?

Mr. ELDRED. Performance decrement.

Mr. PRESNELL. To meet the present laws that we have to meet on our motorcycles we are talking in terms of upwards of 10 percent loss on our machines, powerwise, horsepowerwise.

Mr. ELDRED. Those are four cycles.

Mr. PRESNELL. Four-cycle and two-cycle.

Mr. ELDRED. How much more noise reduction do you believe that could be engineered into the motorcycle before you end up getting around the package envelope constraints that you have?

Mr. PRESNELL. The difficulty in answering this question is that there is very little that can be done in existing package. It has to change. Because volumes of the muffling, intake and exhaust,

have to increase. There is no space to increase it. And, therefore, any improvements require packaging changes.

Now, however, we can go, as far as putting larger intake and exhaust silencing is really a matter of conjecture.

Mr. ELDRED. I see. Is there work going on to see how quiet you can really make a motorcycle? Do you have any experimental motorcycles that are engineered for quiet and not necessarily for other parameters?

Mr. HALE. Work is being done in this area. I don't know of a particular experimental quiet motorcycle, per se. But as far as I know every company is doing a considerable research job in this area.

Mr. ELDRED. Thank you.

Dr. MEYER. Dr. Johnson?

Dr. JOHNSON. I would like to ask which codes you have had problems in meeting. A while ago you mentioned that your product does meet all existing noise codes. I would like to ask which are some of the codes that you have had to meet.

Mr. HALE. Which are some of the codes—

Dr. JOHNSON. You said a while ago that your existing product meets all existing codes.

Mr. HALE. Which are those codes?

Dr. JOHNSON. Noise codes.

Mr. HALE. The State of California, the city of Detroit, and the city of Chicago.

Dr. JOHNSON. And all of your products do meet their codes as sold?

Mr. HALE. Yes, sir.

Dr. JOHNSON. Now, if I understand you correctly in answer to Mr. Eldred's last question, you do not have—neither of your companies do have a quieting program per se?

Mr. HALE. No, I didn't mean that. I just meant that as far as I know, there is no experimental quiet motorcycle per se, which anybody is demonstrating to the general public. Each company, as far as I know has an active research program underway to try to reduce motorcycle noise.

Dr. JOHNSON. Are you free to tell me what your program, what your company has underway in this direction?

Mr. HALE. In terms of expenditure, approximately?

Dr. JOHNSON. No, in terms of the definition of the program you are pursuing.

Mr. HALE. Primarily the program involves redesign of exhaust systems and intake systems. These are the two main areas in which we are working on.

Dr. JOHNSON. Are you free to tell me about Harley-Davidson?

Mr. PRESNELL. Well, it is very similar to Honda's. We do have—Harley-Davidson is a subsidiary of AMF and we have another group in AMF who is now funded by Harley-Davidson under a separate contract to work on intake and exhaust and actually overall vehicle noise on our motorcycles. And they are actively pursuing this and have been for over a year.

Dr. JOHNSON. What conditions—what are the conditions that you feel that create the greatest nuisance to the public as far as motorcycle noise is concerned?

Mr. HALE. The opening conditions, sir? Operating conditions, or you mean just as a general question?

Dr. JOHNSON. Both.

Mr. HALE. As a general question, again I would say modification of the machines. And as an operating mode, if the individual wishes to make noise he will in fact modify the machine and then operate the machine in a manner which will cause it to create its maximum noise, if that is his objective.

Dr. JOHNSON. I wondered what are these operating conditions that he would find to do?

Mr. HALE. Not necessarily, but perhaps. modes.

Dr. JOHNSON. At very low speeds?

Mr. HALE. Not necessarily, but perhaps.

Mr. PRESNELL. This is where it causes the most attention.

Dr. JOHNSON. The higher speeds of course become a nuisance only on the higher speed highways.

Mr. HALE. Yes.

Dr. JOHNSON. And I think in general, most people exposed to these in cities, at stoplights when the motorcycle is sitting still—

Mr. PRESNELL. You find this very annoying at stoplights, at quiet hours, late at night, in residential areas, these are very bad offenders.

Dr. MEYER. Mr. Martin?

Mr. MARTIN. You mentioned the racing cycle. Roughly as—out of the total market of motorcycles sold, what percentage would you say are the racing cycles?

Mr. PRESNELL. I don't have any good figures. I would have to say it is a fairly low percentage, a good percentage of the machines used for racing today are modified street machines and they buy the racing components to modify them. But a total percentage, I would have no idea.

Mr. HALE. I couldn't answer. Honda does not sell any all-out racing machines.

Mr. MARTIN. On that basis, knowing that the industry needs uniform laws across the land, would there be any objection from either—within the industry if special laws were set up to regulate racing cycles such as special track locations by each community or locale as opposed to the average cycle sold for general highway or urban use?

Mr. PRESNELL. I think we would certainly be in favor of regulation of racing machines. As a matter of fact, the American Motorcycle Association, which governs motorcycle racing primarily in the United States, has passed a resolution that beginning January 1 of 1972, all racing machines, with a few exceptions, of particular races, will have to meet a maximum 92 decibels. This may sound rather loud but that is a maximum noise output and these are very loud motorcycles right now.

Mr. BOLT. I have no questions.

Dr. MEYER. Before we excuse you, I would like to ask a couple of questions, if I might.

Do you have any information readily available as to specifications for purchase of heavy-duty road equipment by police departments? Have any of them come in and said to you, for ex-

ample, "Mr. Harley-Davidson,"—who I know is one of the largest manufacturers in the world of this type of equipment—"we want such and such a noise level?"

Mr. PRESNELL. The only requirement that we have is in California, and they say that the police motorcycle must meet their state requirements.

Dr. MEYER. There have been no municipalities or State governments which have included this in a procurement specification?

Mr. PRESNELL. No, sir.

Dr. MEYER. Obviously if they did then you would have to try to come up with it in order to bend to them.

Mr. PRESNELL. Yes, sir.

Dr. MEYER. Another question, what percentage, roughly, is the heavy-duty equipment in the total industry's output? I am talking about the really large motorcycles.

Mr. PRESNELL. Are you speaking of police usage?

Dr. MEYER. No, of the industry, total industry output. If you would classify them in cubic centimeter displacement.

Mr. PRESNELL. You are speaking of, say, the large motorcycles of, say, above 750 or 750 cc.'s?

Dr. MEYER. Right. What percentage of the market does this represent?

Mr. HALE. I would say roughly 10 percent.

Dr. MEYER. About 10 percent.

Mr. HALE. That is a guess.

Dr. MEYER. Well, I want to thank you gentlemen for your candor in meeting some rather pointed questions which are very valuable to get into the record, particularly this last line of questioning with various panel members. I do appreciate your industry's cooperation with us and we look forward to continuing to work together to try to solve this very difficult problem.

I would now like to ask Mr. Joseph F. Ives of the International Association for Pollution Control, if he is present.

Mr. IVES?

Mr. Ives, do you have a prepared statement, sir?

Mr. IVES. Yes, sir, I do.

Dr. MEYER. Could you give a copy to the young lady here?

Mr. IVES. All right.

STATEMENT OF JOSEPH IVES, INTERNATIONAL ASSOCIATION FOR POLLUTION CONTROL

Mr. Chairman, members of the panel, ladies and gentlemen, I wish to make a prepared statement for representing the views of the International Association for Pollution Control on the broad problems in environmental protection.

The International Association for Pollution Control is a professional, educational, nonprofit association whose membership is composed of individuals and organizations from government, industries, institutions, and associations, as well as private individuals who are professionally active in the field of environmental control. The IAPC provides a forum for exchanging in-

formation on the problems, policies, plans and laws which are being formulated by numerous groups working on environmental problems. These groups have shown an increasing trend to compartmentalize into several distinct categories, such as air, water, solid waste, noise, thermal, and radiological pollutants. These several categories of pollutants cause problems which are interrelated, in many cases, and require an interdisciplinary approach to provide correct solutions. These problems must be solved ultimately on an international basis rather than a local, State, regional, or national level. Solutions to environmental problems must be considered with respect to their technical feasibility, economic reality, legislative possibility, and sociological and ecological consequences. Solutions to environmental problems must be carefully examined and reviewed before precipitous actions are taken. Solutions to environmental problems must be reasonable, comprehensive, and universal.

The International Association for Pollution Control was founded to provide a single neutral forum for examining the many interrelated and integrated problems of total environmental protection. The need for establishing a central source to insure the protection, development and enhancement of the total environment was most eloquently stated by President Nixon in his July 9, 1970, message to Congress, proposing the creation of the Environmental Protection Agency.

As concern with the condition of our physical environment has intensified, has become increasingly clear that we need to know more about the total environment * * * land, water and air * * *

Despite its complexity * * * for pollution control purposes, the environment must be perceived as a single, interrelated system * * *

Because environmental protection cuts across so many jurisdictions * * * I believe that in this case, a strong, independent agency is needed. That agency would, of course, work closely with and draw upon the expertise and assistance of other agencies having experience in the environmental area * * *

In organizational terms, this requires pulling together into one agency, a variety of research, monitoring, standard-setting and enforcement activities now scattered through several departments and agencies * * *

The IAPC was incorporated under the nonprofit corporation laws of the District of Columbia in 1970 to provide a professional organization to further the objectives stated by President Nixon.

The membership of the IAPC is composed of private individuals, and individuals from institutions, associations, industries, and government agencies who believe that environmental control activities must be examined on an integrated basis to assure that new environmental problems are not created in the process of solving existing ones. The members of the IAPC are economists, sociologists, engineers, lawyers, scientists, and businessmen who wish to inform others about their activities in the environmental control field and to receive information from fellow workers.

The activities of the International Association for Pollution Control are designed to further the general objective of the association. This objective is to provide a reasonable, professional, and integrated approach to environmental problems. This objective is being promoted by scientific, educational, and legal programs informing members and the public by seminars, conferences and publications. The topics of these seminars and publica-

tions are international, national, and local laws; scientific research and technology; and economic analysis and planning. The IAPC serves on advisory and ad hoc committees which are attacking environmental problems.

Members of the IAPC serve on a volunteer basis, and there are no paid employees except clerical assistance.

The International Association for Pollution Control wishes to offer the services of its membership to the Office of Noise Abatement and Control in attacking the environmental problems associated with its mandate.

I thank you very much.

Dr. MEYER. Thank you, sir.

Let me, before asking the panel if they have any questions, ask you a couple of questions.

Could you provide a little bit more information about the scope of the membership?

Mr. IVES. We have members from Batelle Memorial Institute, the National Science Foundation, the National Engineering Group from the National Science Foundation. We have members from industry, from the principal trade associations, which are interested in environmental problems. We have members from the Government, Dr. Charles Bates, who is chief scientist of the Coast Guard, is a member of our association.

We have people from the oceanographic communities; Mr. Stewart Nelson, Office of Oceanography of the Navy. We have Mr. Gordon Arbuckle, attorney in Washington and represents people in the marine pollution area. We have Dr. Thomas Sullivan, who is connected with several areas of the legal aspects of the environment.

So we have rather a broad membership. We have microbiologists, sociologists. We have membership from England, Australia, New Zealand, Japan, and several Latin American countries. We have membership in Canada and Italy.

Dr. MEYER. I gather from what you have just said that you have several categories of membership, institutional and individual; is that correct?

Mr. IVES. We have, yes. We have categories of members, membership. We have never actively promoted our association. We have mostly grown by just word of mouth, so to speak. We have never had a membership or recruiting campaign. We have attracted—we grow by attraction, not promotion.

Dr. MEYER. I see.

I will start on the left. Dr. Bolt.

Dr. BOLT. About how many members do you have all together?

Mr. IVES. I really do not know exactly. I would guess around 300, in that ball park.

Dr. BOLT. Where is your central headquarters?

Mr. IVES. Here in Washington. We are at the Booz-Allen Building in Bethesda, Md.

Mr. MARTIN. As far as the noise areas specifically in your association, how many of your members deal in the area of noise?

Mr. IVES. I would say—well, I know at least three. I don't really know the technical background of every one. We have the gentleman who was to make this presentation. He is head of our committee on noise abatement. He is from the Northrop Corp. in California. He was unable to make the meeting. I have worked in the area of noise reduction in my—in fact, I taught acoustics at Georgetown University. I worked in the field many years ago. However, I have not devoted much activity recently. I have edited one group of papers on noise reduction back in 1950, which consisted of all of the German documents which were captured after World War II, and this was for the Office of Naval Research. And I have been active on classified programs, about that time, in submarine noise reduction.

Mr. MARTIN. All right. Thank you.

Dr. MEYER. Mr. Johnson?

Dr. JOHNSON. Could you tell me how you operate without any paid employees?

Mr. IVES. We operate from our membership dues, and interested members of the association use their secretarial services, and we do have several volunteers who we pay who do some of our paperwork for us.

Dr. JOHNSON. On an hourly basis?

Mr. IVES. Yes. But all we really do is pay their expenses, you know, like a babysitter, and their parking fees, and we use the offices of Capt. Joseph Taussig in downtown Washington, and we use the offices of Dr. Thomas Sullivan in the Booz-Allen Building.

Dr. JOHNSON. Where does the income come from?

Mr. IVES. It comes from membership dues, and we also—I recently edited a book of proceedings on marine pollution control which we sold and we are getting some small income from that. This is a book—the proceedings of a conference on marine pollution control.

Dr. JOHNSON. You indicated that you have or at least plan to have a number of publications, and I was curious as to how you expect to finance those?

Mr. IVES. Well, we have been doing it—when we have to put up financing for them we have been doing it ourselves and taking the chance.

Dr. JOHNSON. Hoping that the sale of them—

Mr. IVES. Yes. I financed the publication on the proceedings of marine pollution control. We just broke—hit the break-even mark about a month ago.

Dr. JOHNSON. What do you see as possible relationships between your organization and the Environmental Protection Agency?

Mr. IVES. We feel that we can first of all offer the services of our organization to serve on ad hoc committees. For instance, we are doing that on the Maritime Administration, on ports and terminals in which we are able to present the opinion of our group as to the trend of the activities which are required to solve port pollution problems. Now, the mechanics of it is this:

On this particular ad hoc committee I am the representative of the IAPC. I take notes at the meetings, and then we have a

monthly news letter to the members which we publish, and the problems are stated by me in the new letter, or as a supplement to the new letter, and we request the opinions of our membership on these problems. Some of them, as an example here, are very closely related with this.

Mr. Edward Langloy, who was port director of the Maine Port Authority and head of the Environmental Control Committee for the American Association of Port Authorities, is a member of our association. He is just an example. Others of the association have definite opinions on how to handle these problems.

Now, we also request opinions from people like Dr. Fred Leonard who is a member from the National Science Foundation. Now Fred is a microbiologist, but there are many interrelationships between problems, which is the reason for formation of our association.

We have a broadly based group of people who can furnish information on their activities and examine the problems under the aspect of their technical expertise. That way we feel that we can contribute materially. As an example, in the area of noise abatement, you just cannot isolate the necessary measures for attacking the noise problem from air pollution, from thermal pollution. These are interrelated problems.

Noise is essentially a thermodynamic problem. So therefore air pollution is a vital part of noise abatement. You cannot solve the noise problem and create an air problem. An that is the reason why our association is interested in this area.

Dr. JOHNSON. Thank you.

Mr. ELDRED. Which areas of pollution are the strongest in your organization?

Mr. IVES. We have such a balanced group I would hesitate to say.

Mr. ELDRED. I would assume noise would be fairly low on the priority, with three out of 300?

Mr. IVES. Yes, it is fairly low. I would guess that water pollution is probably the strongest area, with air pollution a close second. And radiology—well, I do not know. I would have to see. But I would guess—

Mr. ELDRED. What are the technical qualifications for membership?

Mr. IVES. We do not have any technical qualifications, because we wish to—the only real technical qualification—I do not want to use the word “technical,” because we have lawyers and economists who are—I do not know, maybe economists are here—we want a broad group of people who are professionally interested in the problems of the total environment. They may not necessarily be qualified; I do not think you could say who is and who is not. We want interest; we want action; we want people who are going to be active in the field, not just a card-holding member, you know.

And to sponsor and encourage this interest we conduct a monthly seminar at the Army-Navy Club in which we get a response from 80 to 120 people each month to listen to speakers who are in all disciplines, who have a part in this attack on the environmental problem.

I do not want to use the word "pollution" either. It is a total environmental problem, and to use the word "pollution" I think that is much abused. No one has yet defined what you really mean by that.

Mr. ELDRED. Thank you.

Mr. BERLAND. From what you said I think—are you essentially a talking organization? You are an organization with people, you provide a forum? Or do you take any action? Does the organization take any action in terms of influencing legislation?

Mr. IVES. No, sir, we do not take action in that sense. We are essentially a talking organization, but as I say, our action consists of presenting general views of the problem as it relates to total environment but not to take any action. We do not lobby and we do not try and change anything in the sense of, you know, like shutting down all the power plants. We do not wish to take action of that type. We are essentially an educational organization, which would be probably a better word for putting it. We try to get as much information, accurate information, as we can for our members and for the public.

Mr. BERLAND. We heard yesterday from the Acoustical Society of America which is essentially a professional organization. Do you work with them? Or is there some way you could work with them?

Mr. IVES. I used to be a member of the acoustical organization years ago. They are essentially an extremely theoretical type organization, I would say. They are not—they are an organization which we could work with, but it is really—we do not have the same objectives. They are a scientific organization, would be a better description.

Mr. BERLAND. Could you then work with another kind of organization, such as mine, citizens—which is action oriented?

Mr. IVES. Yes, indeed, yes, we could. We could work with the acoustical society. I think we have a gentleman from Northrop who is a member of the acoustical society, who was going to make this presentation. Yes, we want to work with all types of associations. Our charter was set up so that no one person or one group can dominate the association. We do not want industry domination or domination by any groups, so the charter is set up that certain types of groups, you know, can elect so many directors so there will be no one group which can cause any—can cause us to emphasize certain things which are an object to them. Like in industry, we do not want the industry to just hammer the industry position in and allow them to take over.

Mr. BERLAND. I take it you sponsor symposia or meetings on certain subjects?

Mr. IVES. Yes, sir.

Mr. BERLAND. All right. Thank you.

Dr. MEYER. Well, it seems to me that an organization such as this, located particularly in the Nation's capital with a large concentration of government, industry, and general public interest, can serve a very useful purpose in this discussion approach, and it is one that I want to communicate with further. Also it highlights, I think, the importance of the sort of interrelationships which were discussed here, the last few questions

especially, with the established scientific, technical and professional societies and the citizens action groups. Perhaps some ad hoc committee arrangement between Government, your organization and organizations such as CAN and the acoustical society might help bring together all of the different interests which you have mentioned.

I think it is something that we in EPA need to talk to you some more about, so I would appreciate if you would get in touch with me, Mr. Ives.

Mr. IVES. Certainly, Dr. Meyer.

Dr. MEYER. You could give me a call and see if we can get together. Since we happen to have a representative of the acoustical society present, along with Mr. Berland and several others, we might be able to work out some ideas as to how all of our mutual interests can be brought to bear in a meaningful way.

I think this is a very fine organization, and I would appreciate it if you would get in touch with me.

Mr. IVES. I certainly will, Dr. Meyer. Thank you for the invitation.

Dr. MEYER. Yes, sir.

At this point I should like to ask Mr. Allen Surosky of the General Testing Labs of Arlington, Va., to come forward.

Mr. Surosky, do you have a prepared statement?

STATEMENT OF ALLEN SUROSKY, GENERAL TESTING LABS

Mr. SUROSKY. I have a prepared statement, Dr. Meyer, which I would like to leave for the record. But rather than read it I would like to kind of summarize it.

Dr. MEYER. If you will submit it for the record, it will be printed after your testimony.

Mr. SUROSKY. Fine.

I am Dr. Allen Surosky, president of General Environments Corp. Our company, through two subsidiaries, General Testing Labs in Springfield, Va., and Inland Testing in Chicago, have been active in the health and safety field for the past 20 years. I would direct my testimony toward the economics of trying to get noise control and ways of trying to motivate people to find out what kind of noise there is around them and to do the things about it that ought to be done.

I am not sure that I speak for my company now. I am really speaking for my own frustrations in trying to do something about this in the past few years.

Our company kind of has a mixed bag in this noise business, and in a very small part we are involved in trying to get other people to comply with health and safety regulations, and on the other hand, in many areas we are a polluter. I guess some of the things that cause us to pollute are—in one area, for instance, in the noise area, are our attempts to cut down pollution in other areas. We do work for EPA in the exhaust emission field, for example.

And if you take a diesel engine and you try to determine that it meets exhaust emission standards, then for about a month

and a half you are going to be creating noise well above 90 decibels around the clock for 7 days a week.

So essentially we are faced with the problem in our company, one of trying to comply with regulations, and it is difficult to do—it is difficult to do because of the motivations of people, even ours. And the other thing that is very frustrating is trying to get other people in industry to comply with existing noise regulations.

Now, I just wanted to read a little thing here. I am quoting Harry A. Nelson, the director of the Workmen's Compensation Division of the Industrial Commission of Wisconsin. And he made a statement that says: "Most employers are strongly actuated by humanitarian motives. They must also, however, consider economic problems and competitive factors."

Well, I mean, it is hard to argue with that. It is hard to argue that all people are not to some extent actuated by humanitarian motives. But I think that what most frequently happens is that the economic pressures that exist on industry and really the struggle for survival are such that the humanitarian motives just for practical purposes do not exist.

Now, there is a wide body of public opinion today that suggests that corporate management should be strongly motivated by the concept of public service. And in principle you cannot disagree with that any more than you can disagree with apple pie or motherhood. You know it ought to be like that.

But I think that in fact life is not like that, and I think maybe we are going in the wrong direction if we try to put moral pressure on industry through boards of directors and things like this to comply. It does not work in the government. We have a series of checks and balances. We have executive, we have judiciary, we have legislative, and we put them there through the concept that the motivations have to be different for different groups.

So what I am really saying is what I think our industry needs is a series of checks and balances and I think that the motivation to comply with noise regulations has to come externally to the industry; it is not going to come from within.

This means that whatever government does in the way of establishing noise regulations is going to take some strenuous activity to enforce. And what I would like to suggest is maybe just a little bit of economic stimulation. Now, we are talking about noise levels, which legally, through Walsh-Healy and a number of other acts, the Railway Safety Act and I guess William Steiger, will allow 90 decibels for 8 hours, and we are talking about generally if not officially decreases in these levels over the next few years.

Well, this kind of noise is around now. If you walk downtown here and have a sound level meter, walk near some of this Metro construction, you are going to see 100, 110 decibels in some locations, and you will see people working there with no protection, really.

The noise levels that we have measured vary at various times. We ran something in the cabin of a single-engine private airplane and we came up between 95 and 100 decibels. We measured

a dog kennel, with as I remember four runs and eight dogs, and we were up around 105 decibels with the dogs barking.

Even our 90-decibels level, and I am sure I am not telling you gentlemen anything, results in progress hearing loss, which I guess someone has decided is acceptable. But even with the 90-decibels level, which results in some progressive hearing loss, we have an awful lot of trouble enforcing it.

Now, I can speak subjectively, because there are certain areas of our own business where we are running levels of between 90 and 100 decibels and in some cases 110. If we go to the Williams-Steiger Act, essentially there are two ways or three ways that you talk about controlling noise. Or preserving hearing, if you will. And they all do not work. You know, they just work to some extent, but they really do not work.

The first thing you talk about is decreasing the sound. Well, in our own work, for example, and I have seen it in a lot of other industries, there is no way to decrease the sound. We can contain the sound and we do. We go through engineering situations like erecting fairly thick walls for cutting down sound transmission, so forth. The next thing—but you know, there are certain areas, and there are lots of them—I guess almost every industry except maybe the food industry has them—there is just really not a lot of good ways of cutting down sound.

The next thing you can do, according to the act, is do something administrative. Well, administratively you can tell people, "OK, when you take your coffeebreak you have to walk 300 yards and get out of this area and go in some room someplace and take it over there." And people do not do it.

Another alternative is to switch people from job to job. Not in our business, but in a lot of businesses the economics again is against this, because typically your high-noise jobs in industry are also relatively high-paying for the same labor or skills. The net result, if a man can only work 4 hours in one area then you try to transfer him to another job in a quiet area for 4 hours, the labor unions generally insist that he is an A worker and not a B, and therefore they want his pay to be at the higher level.

Now, the other alternative is to supply people with sound protection equipment, and this is ear plugs and ear muffs, and we do this. And you know, you put up a memo and say everybody that works in this area is going to wear ear muffs and ear plugs and then you go out 2 days later and they do not.

And I think the real problem with noise is that it is a health rather than a safety associated environment. In other words, you know, if people suddenly dropped dead from noise in any reasonable quantities, then you know everybody would be willing to wear ear plugs. But it is sort of like chest X-rays or seat belts, people are just not going to do it even if you tell them it is good for them and if they believe it is good for them; they are just not going to do it.

I don't and other people don't. There has to be some way to make them do it. About the only way that I see is to insure close management and supervisory attention.

Now, when Walsh-Healy first came out with the 90-decibel, 8-hour requirement our Chicago laboratory decided that here was something where people finally had a requirement they were going to have to do something and that would be a good business for us to be in. And again we were not completely altruistically motivated. We thought here was work we could do and work we could make money at.

I guess that is true of our whole society. On the other hand, I have been fortunate enough to be able to pick the things that I want to do through most of my professional life, and in general the things that our company does are things that I think are worth doing. I think they are significant. There is really nothing we do that we think is useless, and we do it just because there is money in it.

So we think noise protection is important. So we contacted I guess over a thousand plants in the Chicago area who were subject to Walsh-Healy and said, "Hey, you are subject to Walsh-Healy and you cannot make any more noise than this in any of your operations, and these are the levels, and for a very nominal fee," which I think was something certainly under \$200, "we will send a team of men into your plant, survey your operations, and tell you what you have."

The response was almost universally, "We are not going to do anything until the Government comes in and measures it and tells us that we are in violation."

I think out of 1,000 responses we got two people that said, "Hey, that is a good idea, come in and tell us what we have."

We have at least 100—maybe 10 who said we are doing it ourselves, and we have at least 100 who said, "No, we do not think we are violating. If we are, let them come in and measure it."

Now, I do not think these people are cruel or unreasonable; I think they have strong pressures in other directions.

Now, the only act that I have seen that has been effective and that has gotten some substantial response in terms of employee protection is the Coal Mine Safety Act. And I think that the reason that this is effective compared to the railroad safety and construction safety and Walsh-Healy and even Williams-Steiger, which is not being implemented very heavily, is that there were a series of coal mine disasters, maybe 20 or 30 over a 5-year period, and people finally—public opinion just rose against this situation in the coal mines and they came in with a strong act, which is fairly well enforced by the Bureau of Mines. And the Bureau has a real effective way of doing it. They have set up a school where either people from the mines or disinterested third parties or government inspectors will go to school for a couple of weeks and find out how to make these measurements in terms of noise, in terms of dust pollution, and ventilation, all of the health, safety things involved. And then from then on they are qualified to make measurements.

If the guy has a four-man mine he can send somebody to the school. Twice a year he has to send in a certificate and say "My noise levels and dust levels are acceptable."

Just the very act of having to send in a certificate is the difference between—the act of reporting, in other words, is

enough to make I would say the majority of the people responsive to the act. They do not have to pay anything, they do not have to do anything, but they have to go out—a guy hesitates to sign a certificate that he is doing something without looking to see if he is doing it, whereas if he does not have to do anything but the law says there you are, why it is generally ignored.

The Bureau has a series of administrative fines which are generally fairly nominal, and they are generally not imposed if the people are making a sincere effort to comply. Essentially reporting and the threat of a little fine is enough to make people pay attention. In other words, I think that generally it is the same as if I drive downtown and it costs me \$3 to park and there is a place with 1-hour parking for—I am going to be 3 or 4 hours, I would rather pay a parking fee than pay the same amount of money in a fine, even when I may not get the fine.

So what I really think is that for this thing to work you are going to need two things: one, you are going to have to make people—you know, it is really not feasible in industry to have enough inspectors to go around to maybe half a million or a million four-man or great companies in this country and see what they are doing. So I think what you have to do is make them react, make them say yes, we are complying, and then you can use your own people to spot check.

A spot check can in effect be partly a spot check, but more than that I think there will be a number of areas that are readily suspect. And if you do enough policing of the suspect areas, and if you demand some reaction from everybody, even if your reaction is a piece of paper once a year, like a W-2 form or any one of the other hundreds of forms that businesses now use for filling out, this would just make a tremendous difference in the enforcement.

The other area I think where you might get some substantial help is from the insurance industry. You know, in sprinkler buildings, certainly the insurance rates, if you look carefully, are enough to pay for a sprinkler system. We installed a sprinkler system in our New Jersey laboratory strictly on an economic basis. We looked at the numbers and in 5 years our insurance savings paid for the sprinkler installation.

I think, considering the great increase in hearing conservation and especially increase in its appearance in workmen's compensation, insurance companies have a lot of motivation to work with industry and reduce rates for people that do comply.

So summing up, just like I say, I think that EPA should establish a universally applicable noise code for industry, and this primarily because workmen's compensation laws State to State are all over the lot. For instance, loss of a single ear hearing in Arizona is worth \$11,000 in workmen's compensation. And I think Missouri, one of the States, it is not worth anything.

I think that you have to enforce whatever codes there are through routine inspection and reporting by either the industry or by a third party, disinterested people. And through the use of EPA personnel, that the quality of the work of the certifying people be checked.

I think you have to make it cost as much not to comply with regulations as it costs to comply, and in general it does not cost a lot to comply because the regulations provide a lot of alternatives. But it requires attention. In other words, it requires a supervisor to look every day and make sure that a guy who is supposed to be wearing earplugs is wearing earplugs.

Finally, I would like to suggest that EPA enlist the assistance of the industry in attempting to provide economic incentives for compliance.

Thank you.

(The written testimony of Mr. Surosky follows:)

I am Alan E. Surosky, president of General Environments Corp. Our company and its subsidiaries, General Testing Laboratories of Springfield, Va., and Inland Testing Laboratories of Morton Grove, Ill., have been active in the health and safety field for the past 20 years.

My testimony is directed toward economic motivation for adequate noise control and personnel protection in industry. I speak first from the standpoint of a group interested in the control of noise and protection of personnel in industry since in part this is our business. Second, we do require noise protection for our personnel in some of our other business activities, and so I also speak from the standpoint of a company which has experienced the difficulties of enforcing noise protection procedures internally.

I would like to quote Harry A. Nelson (director, Workmens Compensation Division, Industrial Commission of Wisconsin) who said, "Most employers are strongly actuated by humanitarian motives. They must also, however, consider economic problems and competitive factors." I agree with Mr. Nelson since most people are morally motivated to some extent, but I would add that of necessity economic problems usually outweigh humanitarian considerations.

There is a considerable amount of public opinion today that industry must consider public service as a principal motivating factor. I cannot agree with this sentiment as a practical matter. Much of our industry is in a position where the struggle is one for survival in a depressed economy, and the problem is where to most effectively get and use funds for vital short-term needs rather than deciding which of a series of long-term desirable programs to undertake. I think it is a good generalization that the economics of our society today motivate against voluntary compliance with most of the factors known to have a deleterious effect on our environment. We know from experience that this is true in the relatively obvious cases of air and water pollution. It is even more true in the case of less noticeable noise pollution.

I do not consider this an indictment of our system. Just as we have a series of checks and balances in our Government I think that we require a similar system in industry. It is just not reasonable to expect a single economic stimulus to provide for an antithetical set of responses from industrial supervision. We must look to separate external stimuli to provide the desired reactions on the part of industry to noise control.

One of the main problems with noise as part of our environment is that over the years we have grown more and more accustomed to increasing background noise. Moreover noise is a health rather than a safety problem. Rarely are people harmed catastrophically by noise itself. More often the damage is a long-term deterioration of hearing and not necessarily of such a nature as to disturb the communicating ability of the individuals affected. There are of course qualitative effects (such as a decreased ability to fully hear and enjoy music) which are subjective and do not lend themselves to measurement. As a result people are no more easily persuaded to protect themselves from noise than they are to wear seat belts in automobiles, take chest X-rays provided free of charge, or to stop smoking. It is necessary and possible to legislate noise control but the mechanism of making it happen must be different from the normal operations of our economic system.

All of the ordinary economics of the situation are in favor of louder noises. In general some percentage of the energy used in production (and I have heard the figure 7 percent used) goes into creating noise. While occasionally there may be a step function in the other direction through the change of the process such as substituting cutting for hammering, it can generally be

expected that increased productivity will bring with it increased noise. If we believe in history there is no reason to expect otherwise unless external pressures are involved. Before suggesting the nature of antinoise economic pressure let me emphasize that noise is with us now.

There is a good deal of disagreement about what levels of noise are harmful to individuals, but the levels that are commonly accepted in various acts such as Walsh-Healey, the Construction Safety Act and a number of others are that people can be exposed to 90 decibels for 8 hours per day, 95 decibels for 4 hours, 100 decibels for 2 hours, etc.

Now we are really not talking about unusual levels of noise when we talk of these values. Air compressors and jackhammers such as are being used locally in the construction of the Metro System create noise levels above 100 decibels. Bulldozers with mufflers typically run of the order of 100 decibels. Inside the cabin of a light plane we have seen numbers of 95 decibels as an average noise level. A dog kennel with four runs and eight dogs has been measured in excess of 105 decibels. A 50-cubic-centimeter Honda motorcycle, which is about as small as they get, measures somewhat over 90 decibels. The point I am trying to make is that most of our industries have serious noise problems today.

The most recent act creating regulations against occupational noise exposure is the Williams-Steiger Occupational Safety and Health Act of 1970. This act again uses the accepted legal criteria for noise exposure of 90 decibels for 8 hours, etc. and provides a series of options. The act calls for first, engineering controls, second, administrative controls, and finally, personnel protective equipment, to meet these limits. All of these techniques meet with considerable resistance.

First, from the standpoint of engineering changes, decreasing noise level means both increasing cost and/or decreasing productivity. Administrative changes such as limiting of the time of exposure of individuals by switching people from job to job again meets resistance for economic reasons. Labor unions in general will resist job switching or will insist that all personnel be paid at the labor rate for the high-noise job which is typically the higher paid job. Other administrative techniques such as requiring people to leave a work area to take a break require constant supervision to assure compliance.

Finally, it is extremely difficult to assure that personnel provided with safety devices will use them. In our own experience we have provided employees with earplugs and ear-muffling devices. Although we have intelligent, technically skilled personnel it takes almost constant management supervision to insure the use of safety devices. Some improvement in the use of these devices has been obtained through the training of personnel but under any conditions it requires continuous supervisory pressure to insure their use.

In the case of the Walsh Healey Act (which applied the 90 decibel, 8-hour requirement to government contracts) we contacted over 1,000 companies involved in applicable work in the Illinois-Wisconsin-Indiana areas. The strong consensus of opinion was "We are not going to worry about conformance until the Government surveys our plant and tells us that we do not conform." It appeared to us from this response that industry had no intention of policing itself.

When the Williams-Steiger Act was passed we talked to the Department of Labor in the Chicago area. They had available 10 inspectors to police over 13,000 manufacturing firms in the Metropolitan Chicago area alone in all aspects of health and safety including noise. It is not reasonable to expect an inspector to control the safety aspects of over a thousand plants. What then is an approach to assure a reasonable degree of compliance with health and safety laws and what economic motivation can be applied? One answer to this lies I think in an examination of the application of the Coal Mine Health and Safety Act of 1969 by the Bureau of Mines.

This act applies the same noise tolerance limits as the Williams-Steiger, Walsh-Healey Act and many others. Here, however, for the first time, the law has been fairly well enforced as a result of widespread unfavorable publicity resulting from a series of coal mining accidents. The enforcement technique developed pretty much as follows:

First, the Bureau of Mines did not have the physical staff to personally police the compliance of the thousands of mines involved. They therefore set up a short training school for Government inspectors, operator personnel, and qualified, unbiased third-party personnel who were then certified as

competent to make the appropriate measurements in the mines. The Bureau of Mines requires semiannually certification that the mines meet the noise standards of the act. Bureau of Mines personnel themselves spot check various mines on a random or on a selective basis. A program of administrative fines is set up such that the fine is about equal to the cost to a mine of determining its compliance. Now the mineowner had a simple decision to make—would he rather pay a fine or would he rather take the same amount of money and assure healthy working conditions? The answer usually is the same as we find with the parking problem in most cities today. Most people would rather pay a \$2 parking fee and park legally than they would take a chance on paying a \$2 fine for overtime meter parking.

I believe that people will respond to the requirements of a health and safety act when it is made easy for them to do so and when it becomes just as cheap to comply as it does not to comply. The concept of an administrative fine can be used effectively by applying it only to those organizations who have not made a sincere attempt to determine their compliance situation and to correct existing deficiencies.

The other economic impetus to compliance with noise requirements might very well come from a reduction in applicable insurance rates as they presently exist, for example, in the case of sprinklered versus nonsprinklered buildings. The problem of occupational loss of hearing has grown tremendously in the past 25 years. Many thousands of claims have been filed and if they were all allowed a large number of employers and insurance companies might well become insolvent.

Since most occupational hearing loss comes under workmens compensation, the laws vary considerably from State to State. The drastic differences in State laws are tabulated in the Commerce Department publication "The Noise Around Us." The value of the hearing in a single ear varies from nothing in some States to \$11,000 in Arizona. Time of compensation varies from 4 months to 2 years. Some States have no standards. It seems clear that the protection from noise in our environment should be equally available to all of us.

It is for this reason that I believe the Federal Government must take the lead in establishing universal standards and requirements and assuring that they are adequately met.

Summing up, I would like to suggest—

- (1) That EPA establish a universally applicable noise code for industry.
- (2) That this code be enforced through routine inspection and reporting by disinterested, properly qualified, and certified third party agencies.
- (3) That EPA through the use of its own personnel qualify and maintain quality checks on the work of the certifying agencies.
- (4) That it be at least as costly not to comply with the regulations as it is to comply.
- (5) That the EPA enlist the assistance of the insurance industry in attempting to provide economic incentives for compliance.

Dr. MEYER. There was a lot of very important meat in what you have said. Before I make some comments I will start on the right, though, and ask Mr. Berland.

Mr. BERLAND. I agree with the chairman. I think there is a lot of good material in there. Maybe for my own elucidation, if you could just expand on some of this. If there were a national workmen's compensation law that would provide for re-compense for loss of hearing which was job-induced, then it would mean that also the employer either reduced the amount of noise in the work situation or provided and assured that the workers were wearing this hearing protection, then his rates would zoom, because he would be paying a lot to workers whose hearing had been damaged. Is that correct?

Mr. SUROSKY. That is correct, but I think you can cut down the time. You know, the timelag on hearing loss is like maybe 10 years, between the time of violation and the time that substantial hearing loss is induced, and the time it gets through to the workmen's compensation boards. I think if the insurance

companies were sufficiently motivated—you know, you don't need a fire, for example, in a sprinkler building to see the difference in damage before you get a saving in rates.

In other words, you can go in and see a sprinkler system. Well, I would think that qualified technical inspectors could go in and see hearing protection, the same way you could see a sprinkler system. I think that reduction in rates could well precede the long-term hearing program.

In other words, it could be an immediate incentive.

Mr. BERLAND. This provides an economic motivation to employers to immediately institute provisions, Walsh-Healy, and so forth.

Mr. SUROSKY. Yes, sir.

Mr. BERLAND. So what you are—what you really need, you are saying, is a combination of legal and economic pressure upon industry to go in and do these things, lower the amount of noise and protect the hearing organ?

Mr. SUROSKY. That is what I think, and I speak from my own frustrations in trying to get people to comply with a law that just has no teeth.

Mr. BERLAND. Thank you.

Mr. ELDRED. You touched on the problem of the difficulty of getting people to wear any kind of ear protection device. I guess this may be part of the rationale behind the current regulations which tend to suggest that industry should quiet, rather than depend on ear protection.

But in the areas where you can't do that, and I guess you have quite a few test situations where that occurs, and one has to use ear protection, have you found anything that really works, some combination of incentives and statistics, for techniques, test engineers, to have them actually protect themselves?

Mr. SUROSKY. No, I think that—I guess in the past couple of weeks, when I started thinking about my testimony here today, I got to looking at what we have done ourselves. The answer is that our own company has been remiss. We are not remiss today because I personally exerted a lot of pressure at present to see that we are in compliance in these areas. But I don't think there is any reasonable economic incentive to people to protect themselves. I think that it really has to be supervisory pressure. I think it is just going to have to keep coming from the top of the companies.

Dr. JOHNSON. In your testimony you dealt almost exclusively with destructive effects of noise, particularly on man. I just wondered if you have anything at all to say about environmental quality, noise as it related to environmental quality?

Mr. SUROSKY. Well, you know, I have read a lot of the previous testimony given here, Dr. Johnson, and certainly you, more than I, know what the technical aspects are of noise on people. And it is certainly a subjective state, but I think there is no question that almost universally, people prefer and are happier and are less irritable in a quiet, peaceful atmosphere.

I know that even in my own case—now I am speaking strictly as a layman—if I really have to do some work and produce something requiring thought in a short period of time, I'll fre-

quently pack up and get out of the office or go some place quieter where I can sit and think. So there is certainly no doubt that noise in a normal sense is a pollutant and that it does deteriorate—just makes our live less desirable.

Certainly, you know, in talking about hearing loss, workmen's compensation is concerned mostly with loss that affects ability to communicate, and there is certainly no question that high-frequency noises which are so important in enjoying music, for example, are just not considered in measuring organometric hearing loss for legal purposes. And you know, what it is worth to a person not to be able to fully hear music is a subjective thing and you can't measure it, but it is certainly there.

Dr. JOHNSON. Thank you.

Mr. WISE. Carrying Mr. Eldred's question a little bit further, the question comes to my mind, if the real reason people are not wearing the ear plugs and ear muffs, is because it doesn't make that much difference to them, or maybe that is not the reason. And that is my question: Have there been any tests made or any surveys as to whether these apparatuses are really effective?

Mr. SUROSKY. There has been a lot of tests made, and there is no question that properly fitting earplugs and properly designed muffs are effective. They are expensive; they are a little uncomfortable. There is a feeling among people when they wear earplugs that they can't hear something that they ought to hear. Now, for the most part, that is not true. If you speak to someone loud enough to be heard in a noisy environment without earplugs the same differentiation will be enough to communicate in the reduced ambient if they do wear plugs.

But I think the problem is really not that they don't do any good, but I think it is the same problem that if you tell somebody something is going to hurt them 10 years from now, they just don't care. You know, one more time, or I'll just do it this once, or—and it is the same with smoking, and—you know, for the last 15 years, people have been telling me that I ought to get a physical exam every year, and I believe them, and I know they are right, and finally after about 10 years, I went out and got one and now I am much relieved that I did. But people just don't do what is good for them in terms of health. In terms of safety it is a lot easier to get it across.

In other words, if one out of every 2,000 people dropped dead from noise explosions, everybody would be willing to wear ear plugs and ear muffs. But if 10 years later someone says, you are not going to hear as well, people just don't react to that.

Mr. MARTIN. Have you had any experience in trying to get unions to get their members to cooperate?

Mr. SUROSKY. I haven't had any personal experience. I have heard a lot of reports, and again, the unions, too, are motivated by a number of things. One, they are perfectly willing—in fact, they are strongly in favor of any health and safety regulation. By the same token, again, they are motivated or their motives have to be economic motives, and their motivations—if a man is going to have to do this, he is entitled to more money. That may be a general situation, but that seems to be their attitude.

But unions, for the most part, are willing to insist upon compliance, but they also want to get paid for it. And again, you know, a union is not in the same position to enforce on-site health regulations as a supervisor is. In other words, you have to have close supervision. It has to be—someone has to be there, tap him on the shoulder, say, "Charlie, you don't have you earplugs in; get them in."

Dr. BOLT. You brought out an important feature of noise control problems when you mentioned that there were three approaches that you have looked at; one is building walls around the source or otherwise reducing the noise there; and the second one is administrative-type procedures where you move people around, and the third one, the individually worn protector.

Of course, any one of these three, you can make some reduction. Each of these has its own costs. Also, of course, your brought out that hearing loss depends not only on decibels, but also on the time pattern of exposure. And if you put all of these facts and other related facts together, and look at the economic problem, at the economic incentive requirement, which certainly is important here, then you can ask the question, what is the most cost-effective approach, or, how can I make the economic incentive go the furthest, by analyzing all three parts of the system.

For example, you might knock 10 decibels down by spending \$7 on the wall, reduce the probability of hearing loss by a certain pattern of coffeebreaks or shifts of jobs, and then finally for a certain cost of administration, as well as of the hearing inserts, again another reduction in the risk there.

And my question is when you have perhaps attempted to look at an overall system integrated economic analysis of cost effectiveness, and I should think the result would be of interest, for example, to insurance companies that might get into this type of motivation as well as the costs.

In other words, what combination of these might really give you the greatest, or a specified, reduction in risk for the minimum number of dollars?

Mr. SUROSKY. I think that is an excellent suggestion, Dr. Bolt. We haven't done it and I don't know of anyone else that has. I think that heretofore, because of the spasmodic pressures on controlling noise which are kind of—well, of course, the whole status of noise control is kind of in a state of flux today, because of the recent awareness of it, and I don't think anybody—I think what people do today is generally to take a look at an immediate problem, solve it with the simplest, immediate, expedient in terms of economics and time. And I don't think the time has come yet when people have sat back and looked at the whole problem.

And certainly the logical approach for people in the future would be to do that.

Mr. BOLT. I think the crystal ball would say that in time this noise problem could cost quite a lot of money for the organizations concerned. Have you tried to persuade any of your clients to look at this in an overall way to find the most economical manner in which to protect their employees?

Mr. SUROSKY. We certainly have, and with very little success. The pressures are just not there yet.

Mr. BOLT. Have you put anything in the literature?

Mr. SUROSKY. You know our own interest in this is really—in noise specifically, is only maybe 2 years old. What we have essentially managed to accomplish in 2 years is find out what the problem is. We don't really have any pat solutions.

Mr. BOLT. Thank you.

Mr. BERLAND. I wonder if you could contrast for us the apparent lack of success in getting workers to wear any sort of protection for their hearing, but the apparent success in industry in other sorts of safety measures such as safety masks, welding masks, tipped shoes—

Mr. SUROSKY. I think the real answer to that, I tried to bring that out, is that safety glasses, hard hats, steel-tipped shoes, are all safety measures, and ear protectors are a health measure. And it is a lot easier to enforce a safety measure where there can be a catastrophic result as against a health measure.

You know, even silicosis, I guess 50 years before people really got het-up about it, we still have it around today. The real reason is that people don't end up in the hospital from silicosis; they end up in the hospital 15 years down the road.

Mr. BERLAND. It is the immediacy of the threat that motivates them?

Mr. SUROSKY. The immediate threat of a catastrophe lets you implement safety measures. The long-term effect of health defects, which may take years to take effect, make it tough to implement them.

Dr. MEYER. I think following up on that, about 2 years ago, Dr. Shaunessey from the University of California did a study for the Department of Health, Education, and Welfare on the very subject of what people put values on in terms of risk judgments. One of the things he used was the fatality rate per hour of exposure to different sorts of situations.

General aviation has a very high fatality rate per hour of exposure and yet people voluntarily spend fairly large sums of money learning to fly and engaging in general aviation activities. And it is not a slur on that particular segment of our life at all, it just happens to be a fact of life.

He contrasted this with a whole flock of different types of exposure situations. And it bears out several things. One, that immediacy of risk does tend to correlate with the degree of precautions people will take. It also bears out that different people put different values on degrees of risk which they will voluntarily accept. I think this is an important sociological problem we face. Much of the rest of what you have said provides an avenue leading to solution of the problem.

I would like to think of your paper as being on a philosophy of enforcement which this agency is going to have to consider carefully, assuming some laws are enacted, particularly those aspects relating to motor vehicle standards and other standards. The burden is going to rest on the manufacturer and it is going to be quite impossible for the agency to have an inspector every place where something is built. I thought your suggestions about

the systems approach to enforcement were quite valuable, and I am sure the panel shares that view with me.

I think your forthright suggestions are something we are going to have to carefully study in developing our enforcement scheme.

Thank you very much, sir.

Mr. SUROSKY. Thank you.

Dr. MEYER. At this moment we will take a 10-minute ecology break to convene at 5 minutes to 11, at which time we will expect to hear from the representatives of the Boeing Aircraft Corp., who, I hope, will give us some ideas about some of the problems we heard about yesterday, associated with airplanes and aircraft noise.

So we will take a 10-minute recess.

(Recess.)

AFTER RECESS

Dr. MEYER. All right, we will now reconvene and proceed to hear about the possibilities of noise reduction associated with the aeronautical and aerospace industry.

Sir?

STATEMENT OF VAUGHN BLUMENTHAL, BOEING CO.

Mr. BLUMENTHAL. Dr. Meyer and panel members, I am Vaughn Blumenthal, director of noise abatement programs in the commercial airplane group at the Boeing Co.

I have with me, Mr. Richard Russell, who is chief of our acoustics staff.

We have prepared a rather lengthy paper for submittal to the panel here, entitled "Summary, Noise Reduction Research and Development."

In view of the length of this paper, I only plan to touch on the highlights, but we will be certainly prepared to answer any questions that you might see on perusing the paper.

Dr. MEYER. Very good*.

Mr. BLUMENTHAL. I might add that if there are interested people who would like to have copies of the paper, they can write to us at the Boeing Co.

Dr. MEYER. All right.

Mr. BLUMENTHAL. I noticed in some of the earlier questions, that there was a considerable interest in the number of people involved in noise work.

I might tell you a little bit about our organization to give you some feel for the appreciation that certainly we have for noise. In Mr. Russell's staff—he is running the machine over here—currently has roughly 140 people working in acoustics on the staff side of it.

We probably have about the same number of people who are working on the design side, trying to make something of the ideas that the more technically inclined personally in Russell's staff come up with. This number varies, from time to time.

I think Russell's staff at one time was well over 200. Now those individuals are located at Renton, near Seattle.

*This report is on file at the Office of Noise Abatement and Control.

We have also an acoustics staff at our Wichita division in Wichita, Kans, that are very actively engaged in research work, as you will see in some of the things I mention later.

And we also have a very active group at our Vertol Division, in Pennsylvania, working on the helicopter noise reduction.

So all in all, I could guess that we have well over 400, perhaps approaching 500 people within the Boeing complex at the present time, working in the fields of acoustics in some form or another.

Our research has extended over many years. The chart that we are showing here at this time gives an indication that this has been a costly program.

FIGURE 1. BOEING NOISE REDUCTION RESEARCH
(in millions of dollars)

Year:	Boeing R. & D.	Government contract	Total
1958	0.001		0.001
1959	0.106		0.106
1960	0.282		0.282
1961	0.472		0.472
1962	0.550		0.550
1963	0.310	0.022	0.332
1964	0.140	0.300	0.440
1965	1.384	0.210	1.594
1966	2.528	0.925	3.453
1967	3.197	3.464	6.661
1968	10.957	6.878	17.835
1969	8.508	2.873	11.381
1970	4.447	1.082	5.529
1971	3.594	5.788	9.382
1972 (est.)	2.955	¹ 6.280	9.235
Total	40.031	27.822	67.853

¹ Including possible Government contracts.

Note.—Above expenditures do not include development costs for airplane noise reduction activities totaling more than \$25,000,000.

We believe it has significantly advanced the state of the art in noise reduction. The table summarizes the yearly expenditures by Boeing in research and development from company funds, in the second column, and from Government funds in the third column.

And it might be interesting to note that in the last 5 years, say from 1967 to the present, the combined total of the company funds and the Government funds exceeds \$50 million.

This has not been a small activity.

Dr. MEYER. I don't like to break into a witness' testimony. Normally we don't. But there is a question that I would like to ask, if I might, sir.

Mr. BLUMENTHAL. Yes, sir.

Dr. MEYER. If it is not divulging company confidential information, what percentage of the appropriate dollars that are up there reflect effort to meet the part 36 requirements on the 747?

Mr. BLUMENTHAL. Well, that is a difficult question to answer. Let me say why.

I would say that in the last 3 years, in the numbers listed there in 1968, 1969, 1970, there have been expenditures, perhaps a quarter of the number listed there, that would be directly applicable to the 747 airplane.

However, at the bottom of that chart, you will notice a line that says there is another \$23 million associated with the production development.

In addition to that, there is a number that I can only roughly guess at that is in the order of \$150 to \$200 million that we have put into production tooling, and into the actual production of the nacelles that go into the 747 quieter.

And as you will see later, a good bit of the expenditure was made prior to the time that there were Government regulations in existence.

Dr. MEYER. I see.

Thank you. Pardon me for interrupting you. We will try not to do that again.

Mr. BLUMENTHAL. As far as I am concerned, it is much easier if you do. As far as the noise sources are concerned, there are many places within an engine and a nacelle that create noise.

There are some that are more predominant than others. The noise emanating from the inlet is composed mostly of fan and compressor noise. The noise coming out of the fan exhaust is primarily fan noise.

Out of the tailpipe, we get primarily jet noise that is caused by the mixing of the high-velocity exhaust gases and the ambient air.

The noise that emanates from the inlet is generally what one hears as the airplane is approaching the listener, and that from the fan exit and the jet is generally what one hears as the airplane leaves the listener.

The other noise sources, such as the machinery noise, gearing noise, turbine noise within the engine, are generally of lesser significance and do not have to be treated until we have gotten these more predominant noise sources out of the way.

Now, the inlet noise and the fan exit noise can be treated reasonably successfully by insertion of acoustical material within the air passages. And this we have been doing to various degrees on our various engines to date.

The jet noise, or the jet roar, as it is sometimes referred to, coming out of the aft end of the nacelle, really occurs far behind the engine. It is not something that you can grab hold of by putting treatment on the engine. You must do something to break up that jet, perhaps get the jet noise to be manufactured closer to the nacelle exit and then perhaps to do something with it at that point.

And a characteristic of that jet roar is that it is predominantly low-frequency noise as contrasted to the high frequency from the fan source.

The low-frequency noise propagates much further than the high-frequency noise, and it penetrates buildings much more successfully than the high frequency. So in the early jet noise suppression activities associated with the pure jet airplanes, when a jet—when jet commercial airplanes first came into being, were treated with various types of devices.

The first airplanes we built with pure jet engines, had 21 tubes on the back end. Subsequently, we were able to change that to nine tubes, and still get noise reduction, but that is about the limit that we currently know how to do on the pure jet airplanes.

As far as the Boeing family of commercial airplanes is concerned, there are somewhere between 140 and 160 pure jet airplanes flying in the world today.

The turbofan engines, however, comprise the bulk of our fleet and we must have in the order of 2,000 to 2,200 of those airplanes throughout the world.

Those are the ones that I wish to spend most time on at this point, indicating what we have done, what we think we can do, and what the future holds.

We have run many, many tests both ground and flight, to describe the component noise of the various engines. And our commercial fleet today has JT3D engines, JT8D engines, and JT9D on the more recent engines, more recent airplanes.

You will notice on the chart that we have attempted to show on the left scale peak PNL, peak perceived noise levels, for—and on the lower scale, the engine net thrust, and we have attempted to break the engine characteristics in each case, into the predominant noise source type information. (Slide.) We show the noise that comes out of the inlet, the noise out of the fan exit, and the jet noise or the roar that comes out of the tailpipe itself. And these charts, these lines in each case are broken lines, because that portion of the chart on the left is representative of the noise levels that are generated on the approach condition at roughly 370 feet altitude.

The portion of the curve on the right-hand side represents the noise that occurs at the $3\frac{1}{2}$ -mile measuring point consistent with FAR-36, and therefore, are at a higher altitude and a higher velocity.

The curve in the upper left-hand corner, for instance, for the higher thrust is at about 1,000-foot altitude.

The JT8D in the right-hand upper curve is at 1,500 altitude, and these are typical altitudes for 737, 727 airplanes. And the one on the lower portion, which is the engine that is on the 747, again is at about 1,000 foot.

Dr. MEYER. Again, could I just ask a question? We would withhold these interruptions but as you indicated sometimes it is more appropriate.

As I recollect the California law, it would allow 85 dbA's composite noise equivalent level, and if I remember my mathematic correctly, most of those conditions are going to be in excess of 85 dbA, which means that if each one of them is in excess of 85 dbA, the composite noise level is going to be in excess of 85 dbA.

So, does this chart say that these engines simply will not meet the California State code?

Mr. BLUMENTHAL. No, I don't think that necessarily follows.

The California noise law spells out, first of all, the values in terms of dbA, which is a different type of value—

Dr. MEYER. I was subtracting approximately 13 decibels off of this.

Mr. BLUMENTHAL. That is about right, and the distances are somewhat greater distance.

I believe the California noise law states that you should have no residential housing of a certain type within the bounds of

noise that is in the neighborhood of 85. And I would say—I believe from our analysis of the California noise law, that most of our airplanes currently meet that law as it is currently written.

Dr. MEYER. Thank you for clarifying that.

Mr. BLUMENTHAL. Now, this particular chart here has a considerable amount of very useful information on it. We could probably talk about it for an hour. I only want to point out some of the more significant things that can be learned from an examination of this type of chart.

Looking at the one in the upper left-hand corner, the JT3D engine, powering the 707 DC-8 type airplanes, you will notice that the fan exit and the fan inlet noise, particularly in the approach condition, are considerably higher than the jet noise, which you might consider as a jet noise floor.

This suggests that considerable noise reduction can result by putting treatment within the nacelle in the vicinity of the engine.

And from tests that we have run, we have found that this is true. However, as you go to higher thrusts, you can see that the jet floor more closely approaches the inlet and exit—fan exit noise levels which would suggest that simple acoustic treatment within the nacelle would be much less rewarding. And again, that is what we found to be true.

It indicates that we do need some form of jet suppression in order to make much of a dent in community annoyance at the higher thrusts.

You look at the JT8D engine that powers the 727 DC-8 airplanes particularly, and you can find that particularly at the higher thrust there is no possibility of us reducing noise through simple fan treatment, because the jet exhaust is predominant.

Again, we need some form of jet suppression. I emphasize that at this point because later on, I am going to show you some of the work that we have done in attempting to make an impression on the jet noise. Some of it is successful and some of it is not successful.

The lower engine, JT9D that powers the 747 airplane, is a high bypass engine, and in spite of being approximately three times the thrust that other engines have, it really is a quieter engine and we think that this is a significant advancement in the art of building engines.

I think somewhat similar characteristics are exhibited on the CF-6 that powers the DC-10.

Now, keeping in mind the characteristics that you see in the upper left-hand corner, with the possibility of adding acoustic material in the fan duct and in the inlet, the next thing I want to show is what this begins to look like when we applied this knowledge to the 707 nacelle. (Slide.) I might mention that the first attempt we made to build a full-scale hardware was in 1965, well before we heard of any of these current noise laws or had any feel that there would be anything of that sort.

Our first attempts to exploit the knowledge that there was a spread between the inlet and the fan duct noise and the jet roar really resulted in a thoroughly dismal failure. We built four nacelles, flight tested them, and we were entirely unhappy with the results of those tests.

We did learn enough, however, having run the tests, that it set the stage for us to go into the—into a very successful flight demonstration under the NASA contract that we obtained from NASA in 1967, and essentially completed in 1969.

Now, what this sketch shows here, in the upper portion of the chart, is the standard production nacelle, with short fan ducts, with an engine case tightly packed about the engine, with the fan air coming out thoroughly far forward, and with the jet, high-velocity jet, coming out of the tailpipe.

In the NASA contract, we extended the fan ducts from the short ones on the production nacelle to where they coincided with the exit of the primary gaskets. We treated those fan ducts very liberally with acoustic material, and I might say that the development of the acoustic material took many hundreds of tests in small-scale facilities to enable us to tune the absorptive material to absorb the exact characteristics, the spectrum, that was exhibited by the fan exhaust and by the noise coming out of the inlet.

Now, in the inlet, we have inserted two concentric rings. We treated both sides of the rings, we treated the spinner at the center of the engine, and we put lining on the inside of the cowl, so that we, in effect, had about 70 square feet of acoustic material inserted into the inlet.

We had 267 square feet of acoustic material in the fan ducts.

Although this contract did not include any provisions for jet suppression, we did find that the noise reductions during approach conditions were very gratifying, being somewhere in the neighborhood of 15 or 15½ EPNdb reduction from the standard production nacelle.

Not having jet suppression incorporated at that point, the test did point out the need very clearly, that if we were going to suppress the jet roar, we needed something in addition.

Subsequent to the NASA tests, Boeing continued on with the research in an effort to develop a JT3D nacelle that would involve lesser weight penalty on the airplane, lower cost to produce, and some improvements, some further improvements in the acoustic reduction characteristics. We were particularly interested also in developing some kind of jet suppression.

This work then led us into a contract in June of this year, with the FAA, a cost-sharing contract. (Slide.) We bear 20 percent of the cost, the FAA 80 percent. In this one, there are two levels of treatment that we are trying, one with fan treatment alone, and our early tests had shown us that we could cut off the fan ducts and have a balanced installation.

We left the inlet exactly the same as it was on the NASA contract, but on the fan ducts we were able to cut off a significant portion of the last part of the fan duct, thus saving the weight of that heavy ring.

We could put in more efficient acoustic material that we had developed by that time, and get by with about 100 square feet less treatment than we had had in the nacelle—in the NASA nacelle. And this resulted in a weight saving on the total airplane installation, or a decrease in weight penalty, let's say, of something in the order of 700 pounds, which sometimes we sell our

soul for in the development of an airplane during the competition phase.

I will show later on what type of noise reduction this all amounts to, at the three standard measuring points under FAR-36.

Now, let's take a look at the 747 picture. (Slide.) In addition to the work that we have been doing on the 707, we were very actively pursuing what could be done on the 727, and the 737, and in this particular case, we felt that to do very much of significance would require jet suppression, and up to this point we really hadn't arrived at anything that we could say was very satisfactory in the jet suppression end of it.

Although we weren't required to do so by law, we recently completed a noise certification test on the 727. It, in fact, became the first airplane to be fully certified to appendix C noise levels. And that configuration being fan treatment only, the type of configuration shown in the lower chart, in the lower sketch, is in production at this point, and the first deliveries of that nacelle will be made in June.

This shows a comparison between the standard treated nacelle and the—about the best that we know how to do currently with fan treatment alone.

This wraps acoustic material in the inlet, on the inner face of the cowl. Pratt & Whitney in this engine, has a long fan duct incorporated in the engine and they have put treatment on both the inner and outer surface of the fan duct, and then Boeing has installed a length of treatment in the tailpipe.

In this case, both the fan air and the primary jet air come out of the same tailpipe.

Now, unfortunately, the noise levels that we got out of this test confirmed pretty much what we already knew.

We got some reduction on approach noise. We got virtually no reduction—well, absolutely no reduction, at the high-thrust levels, because of the predominance of the jet roar.

So we continued to do research work in the jet suppression portion of it.

The next chart that we will show, indicates a few of the, I would say, hundreds of different model scale suppressors that we had tested over the years, attempting to learn a little bit about the mechanics of suppressing jet noise. (Slide.) Some of what I am going to show you here I want to emphasize is strictly cut-and-try type of testing, the kind of testing that is succeedingly frustrating to a technical expert to have to try something, have the failure, try something else, have the failure, and then go back and try again.

It becomes even more frustrating when you are attempting to justify that kind of testing to your management and they do not like to spend that kind of money. Most managements like to see something beneficial as the result of the expenditures.

So we have tested a large variety of jet suppressors. These here are only a few. You can see that in the upper left hand, there is 37 tubes with corrugated ends.

The next one is a 36-spoke affair, where we are attempting to, in each case, get special air mixing with the jet air itself.

The third one over is a slotted arrangement, and these are just a few of the many, many configurations that we were attempting to try to get some direction to go.

Unfortunately, most of these resulted—well, I would say most of these nacelles had one thing in common, they were quite successful in spoiling the jet, and they did not really do very much in reducing the noise.

We continued to work the thing, and began to try full scale hardware. And again, some of the cut-and-try things we tried on the full scale look ridiculous, but in an effort to find something that you could point to and say, "Well, that does help some," we were willing to try things that we had absolutely no possibility of putting on an airplane.

Now, this is a 19-tube arrangement with the combined primary and fan gasses from the JT8D engine combining out of the 19 tubes. (Slide.) This thing did not do a darned thing for us except spoil the thrust.

As a matter of fact, a number of these things you could say, by merely pulling the throttle back on the basic engine, you could cut the noise down to the same extent that we could achieve at full throttle with these devices on there.

The next one we tried, trying to get a little bit of an initial twist on it, we put gratrex ends on each of these tubes. This began to give us some noise reduction, also a little bit more thrust reduction.

This one was an attempt to put on a multilobe device, where we were getting external air well down into the center of the hot jet. We thought enough of this one that we not only tested it full scale on the ground, but we hung one of these on a 737, and ran flight tests with it.

I will admit that my hearing probably is not as good as it used to be. I stood out in the center of the runway when this thing was making flyovers with first one engine, the untreated engine at full thrust, and then the next time with this gadget here on, and if I faced away from the airplane, I could not tell which engine had it on.

It really did not—it was kind of a disappointment.

We built another one. (Slide.) This is a 6 lobe. For some reason we felt this was going to maybe be a little bit better, and not spoil so much of the thrust at the same time.

Again, we thought enough of this that we installed the full scale, two of them, as a matter of fact, on a 737, and flew that around.

Now, these tests were run in 1968 and 1969, well before any noise legislation came about. (Slide.) You noticed in that last picture on the 737, it did really look like an abortion on the airplane. Normally, from an aerodynamic standpoint, we say if any body looks reasonably decent on an airplane, it is probably not too bad.

This one, of course, did spoil a fair amount of thrust, so we would lose on a takeoff—takeoff characteristic, particularly—and it added some drag. (Slide.) This was another attempt to further understand the characteristics of a JT8D engine. I mentioned

previously that a JT8D has an exit at both the fan and primary gases exhausting through.

Here we extended the inner coil so that we completely separated the primary and fan exhaust gases, feeling that perhaps we were getting some excessive noise for some peculiar characteristic within the tailpipe in the mixing region.

We wanted to find out what might happen if we separated them. Again, we did not really learn anything. (Slide.) Now, this is a peculiar looking device, but this one we inserted within the exit duct in order to improve the mixing between the fan and the primary, feeling that if we could get better mixing before we dumped it out of the exhaust that maybe there would be some reduction here.

We found really that we were already getting fairly efficient mixing in that engine, so that did not add anything but drag. (Slide.) Some of our earlier tests had indicated that if you put two nozzles side by side, and then stand off in a direction parallel to the two nozzles that you get a reduction in noise. It is as if you can only see one nozzle.

So this was an attempt to provide some sort of a directional device, feeling that maybe we could point it in a direction, in a favorable direction.

Again, this is not satisfactory. On top of that, it is almost impossible to build structurally for a production design.

In some of our tests on a JN75 engine, we tried a multilobe device, a 48-lobe nozzle. It just happens that that nozzle fit the primary of a JT8D. In this case, we completely separated the fan exhaust gases from the primary, we ducted the fan gases through a big noise suppressor. We enshrouded the inlet in a noise suppressor such that we had only the primary gas to deal with. And we ran the primary gas through this 48-lobe nozzle.

We were not concerned at this point about whether we could fly anything of this sort, but we had a very long tailpipe with treatment in the tailpipe to take out any interior engine noise component, leaving us only the jet roar to contend with. (Slide.) This began to show some attractive features, particularly when we put a shroud around the tailpipe. In this case, this is a two-stage shroud. (Slide.) We began to get some fairly favorable noise reductions with the ring in that shroud.

The next chart will show you that we got somewhere in the neighborhood of 20-decibel reduction, pretty much across the entire frequency spectrum. (Slide.) This encouraged us enough to go into a new design that was sized such that we could dump both the fan and primary gases from the JT8D through a nozzle. (Slide.) At that time we felt that 36-lobe nozzle was probably the most favorable. I have to admit that that was somewhat guesswork and we would not agree that that was most favorable today, but it looked pretty good at that point.

We built these full scale, and tested them on our facility at Boardman, Oreg. We began to feel that this was something that we could install on an airplane.

This was a case here where we have the shroud somewhat separated from the rest of the engine to show what the components look like. (Slide.) In the next picture, it shows the shroud

installed on the engine. (Slide.) One of the things that is kind of significant to look at here where the pointer is, this is an ejector suppressor principle, with external air being injected or pulled into the shroud by the passage of the exhaust gasses within the shroud. And the shroud has treatment lining it to absorb the frequencies that are generated in the jet at this point.

But having broken the jet up into many, many small jets, the noise is really created much closer to the exhaust, and therefore, it does give us an opportunity to grab hold of the jet noise before it gets away from the airplane.

In June, we obtained an additional cost-sharing contract from the FAA to develop a suitable installation that we could flight test on the 727, and the objective of this was to define more clearly what the performance effects, the cost—installation costs, the overall operational characteristics of such an installation might be. (Slide.) Unfortunately, jet suppression of this type does not come cheaply. I would say that our estimates at the present time might indicate that the range cost on a 727 could approach something on the order of 8 to 15 percent.

The purpose of the FAA test is to get this thing defined in some detail.

Furthermore, on a 727, particularly our long-bodied 727 airplanes, with the engine mounted in the rear end, this begins to develop a balance problem, so that the weight of this installation, plus any balances on that airplane, must be accounted for.

And when I say 8 to 15 percent of range loss, I have not included balances for those airplanes.

On the short-bodied 727-100 airplanes, I would say there is not the same kind of a problem. And really, in spite of having run considerable ground tests on this, the state of the art and the acoustics do not clearly tell us what we are going to hear in the air and only the flight demonstrations are going to really say whether noticeable relief to the airport communities have been provided with this kind of an installation.

We continuously get surprised. I hope we are not surprised by this one.

Now, let's take a look at our 737 airplane. To some extent, you could say that the same devices that were working on the 727 would apply to the 737. (Slide.) The installation differences, however, are rather significant. In the case of the 727, when the airplane is approaching the listener, the inlet tends to be shrouded by the wing.

On the 737 airplane, the engines are mounted below the wing, and are completely free of the shrouding effect, such that the inlet noise tends to be higher on a 737 than it is on the 727.

We tested installation similar to that shown in the lower chart, the lower sketch there, in 1968, and again in 1969, well before any noise levels legislation was published.

We are currently completing a noise design installation and our intent at this point is to voluntarily certify this 737 airplane to the FAR-36 requirements for new aircraft as we did on the 727 airplane.

Jet suppression, however, is very much needed on the 737 if you assume that smaller airplanes would be operating more nearly in bedroom communities.

The installation of the jet suppression device that I described for the 727 may go on to the 737, but the installation problems are completely different. The ability to get fan—to get air under the wing and into the ejector suppressor may provide a completely different kind of a problem with what we have on the 727 with the nacelles out in the open.

Currently, there are no funded jet suppression studies going on for the 737, and without a similar program in the nature of the 727 airplane, it is very difficult for me to predict when such work might proceed.

Let's take a look at the 747 airplane. (Slide.) This one has been very painful to us. Although no Federal noise legislation was in existence during the development period of the 747, and the airplane was actually in flight test prior to the time that FAR-36 noise levels were issued, the airlines, Pratt & Whitney and Boeing, all recognized very clearly that noise reduction was going to be exceedingly important if an airplane was going to be successful in the future, and so the combined efforts of all three parties were included in the early design characteristics of the JT9D engine and the installation on the 747 to insure that the noise levels would be significantly lower than those produced on the 707-DC-8 fleet, which the 747 would be partially replacing.

This accomplishment was demonstrated in the early flight tests, however, with the issuance of the FAR-36 appendix C, noise regulations; it was very clear that further reductions in noise were deemed necessary.

Once you have an airplane in production, to modify the darned thing to put something else in gets extremely expensive.

We have run noise tests almost continuously for the last 2 or 3 years. The noise reduction has not come simply.

The chart that I show here is the latest of a very expensive series of acoustic configuration changes. It shows the current nacelle, with no blow-in doors for the inlet, with fairly complete treatment on the inner surface of the inlet, and throughout the fan duct passages, both within the Pratt & Whitney engine and in the Boeing manufacturing.

In addition, we have put treatment in the hot sections, in the turbine exhaust, on both the inner and outer surface, near the plug.

The—one thing that is different in this installation than we have seen in some of the others, is that there is a 360° splitter ring included in the fan duct, with treatment on both sides of that splitter ring.

This, again, costs a penalty in performance, but the reduction in noise we felt was justified—justified this performance reduction. (Slide.) The photograph now coming up shows a flight picture of one of the new nacelles, and one of the production nacelles up to very recently. The production nacelle has blow-in doors surrounding the inlet.

These were put in here for very definite reasons of trying to get the utmost in performance at high speeds out of the airplane where those doors are closed, and we, in effect, have a fairly sharp, highly efficient inlet, and yet the blow-in doors are needed at the low velocity during the takeoff condition.

The nacelle in the background is the new inlet which has a fatter lip, and compromises on the high-speed performance. We have installed four of those new nacelles on the 747, and have recently conducted FAA certification flight tests.

The preliminary analysis of those tests, test results, indicated that the airplanes delivered from December 1st of this year and on, will be quieter than the levels specified in FAR-26, we think quite gratifyingly so.

However, until the certification is complete, and we have an agreement with the FAA on what those noise levels actually are, we do not feel in a position to announce the exact noise levels.

Now, the discussion up to this point has dealt with how do you treat noise at its source, either by adjusting the characteristics of the engine or putting treatment in the vent of the engine. (Slide.) The next thing I want to touch on very briefly, are some of the benefits that come from the operating procedures, the things that the air traffic control, the FAA, and the pilots themselves can do.

In one sense, you could say that anything that increases the distance between the airplane and the listener is beneficial.

And in the charts that I show here, merely touching on a subject which we have a complete paper on, this shows that if you fly a profile which is very normal up to about a year and a half ago, coming in at rather low levels, approaching the airport—in that case there it shows 1,500 foot—and then descend along a two and a half degree glide slope to the threshold and to the landing, you generate noise levels shown in the lower chart to somewhat in the neighborhood of 100 EPNdb over a fairly extended distance.

You will note the scale at the bottom is in nautical miles.

Many of you who have been around Helmstead, and concerned with the noise levels there recognized that much of the city of Helmstead is within the 10-mile area, 10, 12 miles from the airport.

And I might cite an incident that Mayor Wise would be interested in, at Dallas. It has been 2 years since I have landed at Dallas. The last time I landed I was appalled at the operating techniques that were used.

We came down from an altitude on a clear day, we got the flaps down, could not see the gear, but—I do not know what that situation was—but for about 25 miles prior to landing at the airport, we were coming along at somewhere in the neighborhood of 1,200- to 1,500-foot altitude. Power was on, flaps were down.

That situation does not exist anymore at Dallas, and it does not exist at the majority of other airports around the country, and particularly I am familiar with what has occurred in Seattle.

The intercept with the glide slope has been increased from 3,000 to 5,000, and the chart there, for instance, showing the

3,000-foot glide slope, with somewhat cleaner airplane conditions, lower flap setting during that portion of it.

And then in this case, I threw in another difference, increasing the glideslope to three degrees produces the noise levels shown at the bottom, and you can see the increment in noise benefit that can accrue anywhere from five to 10 or 15 miles from the airport is a reduction that exceeds, in most cases, what we are able to do by treating the airplane itself.

Now, the FAA has issued a "keep them high" order, that in effect is doing most of what you see on the chart. That part, going from two and a half degrees to three degrees glide slope, however, could be very beneficial.

Somewhere between two and a half and three and a half EPNdb is available merely from going from two and a half degree glide slope to three degrees.

Some of us feel that glide slopes in excess of three degrees are not at all impossible.

I might point out, however, that with the 500 or so ILS installations in the United States today, about a third of them are at three degrees, but the balance of them are somewhere between there and two and a half degrees.

I have mentioned Government contracts a few times. (Slide.) The chart that we have here gives some indication of the major contracts that we have at the current time, or have had in the near past.

The largest one by far, of course, is the first one shown up there, the 707 quiet nacelle research program that we had with NASA beginning in 1967. And that one totaled something in the order of \$12 million.

I have already discussed the 727, and the 707 ones that show up further down the chart.

Our Wichita division is currently participating with NASA, St. Louis, on their quiet engine program.

We were building the nacelle complete with the acoustic treatment for their quiet engine. We expect to complete our part of this activity in about 6 months.

The augmentor wing program is one that involves an interesting concept. It is one that we have worked on for some period of time, and that work has resulted in a contract aimed at developing a large transport with low noise.

The sketch here shows one of the early configurations where all of the fan air from the engine is ducted through the wing and through the wing trailing edge flap area. In effect, that large flap area becomes a big augmentor-suppressor, and the primary gases are coming out of the nozzle in the usual manner, but the bypass to the engine is such that the exhaust velocities are low and those noise levels there are reasonably low.

The engine inlet is treated more extensively than I have shown in some of the previous considerations. This one has a choked inlet. By that I mean that we are getting inlet velocity that approach Mach 1.

Of course, the trick in this kind of configuration here is to have enough thrust and performance left over to produce an efficient flying machine, and that still remains to be proven.

Conversely, you might say that the future of the short takeoff and landing commercial transport is dependent entirely upon successful solutions of the noise problem.

If we do not figure out the noise, it is not going to go any further.

Now, let's take a look at what the current status is of our airports today. (Slide.) The next three charts that I am going to show, give effective perceived noise levels on the vertical scale, and the gross weight of the airplane on the lower scale in exact conformance to the noise levels specified in FAR-36, appendix C. The line on that chart is the noise level, in this case for the takeoff condition, measured at $3\frac{1}{2}$ nautical miles from start of ground roll as specified in appendix C. We have almost 2,000 of these airplanes in existence that I show here.

I have to emphasize that in many cases, flight demonstrations are imperative to establish the technical and economic feasibility, and the potential retrofit changes—well, to establish the feasibility from a technical and an economic standpoint, and to really demonstrate whether the changes will in fact be discernible by the public. We still don't know that.

Although the 707, the 727, and 737 airplanes are not subject to the new airplane noise regulations as indicated by that line on the chart, it is convenient to show the noise levels in relation to the FAR-36 line to indicate more clearly where those noise levels occur. The circles on those charts at the upper end of the bars represent the baseline or airplane noise in each of the airports. The solid bars indicate the levels to which we believe we can quiet those airplanes with fan treatment alone.

The dashed bars indicate the levels to which we could go with both fan and jet noise suppression. These aren't necessarily reasonable cost-benefit solutions, but they merely represent the status of the current noise reduction studies that we have engaged in.

The next chart shows the same thing for the approach condition. (Slide.) There you notice that the black bars are quite lengthy, particularly on the 707 airplanes. Those are the noise levels that were demonstrated under the NASA configuration.

I might say before I forget it here that the circle labeled "727, 200 advance," is the noise level that we have recently certified on the airplane with the fan treatment that I showed earlier. I think we could probably put a dashed line below that bar to show some additional suppression possibly with jet suppression if we could ever figure out a jet suppression device that makes any sense.

The next chart is the same thing on sideline. (Chart.) I won't speak any time on that one. (Slide.) The information is all available in the paper I prepared. (Slide.) Now, I have touched on only a few of the acoustic programs in which we have been engaged. For example, I did not mention the vast amount of work that we have accomplished on the SST project in reducing noise of the high-velocity jets that used afterburning. I haven't discussed the very excellent progress made by our Bertrol Division in suppressing and creating a very low noise model 737—7347 model helicopter.

I believe that you will agree, however, that the noise reduction activity that I have just described has not been trivial. It is indicative of the major importance placed on the community noise reduction by the aircraft industry and by NASA and FAA over an extended period of time. There are varying degrees of retrofit that appear technically feasible on both the JT8D and JT3D powered aircraft. However, the performance penalties and equipment costs and operational costs can be quite large and probably will be beyond the capability of the airlines to shoulder alone.

Large retrofit expenditures can only be justified on the basis that a favorable and knowable reduction in community annoyance results. In other words, we should not ask the airlines or the taxpayers to pay for something for the cosmetic effect. It should have some benefit to the community or it shouldn't be done. Much additional work is required in order to cut down on the currently projected performance losses, the operational costs and the program risks, but above all, to further the reduction in the community noise.

Private financing of this noise reduction research is becoming increasingly difficult, as our industry profits decline, less money is available for research and development. That is axiomatic.

Gentlemen, I hope I have conveyed to you some of the frustrations connected with the development of noise reduction concepts. We have sincerely tried in the past and we are going to continue to try to reduce the noise so long as our resources permit.

And now Mr. Russell and I are open for questions.

Dr. MEYER. Very good. We sure will, after this rather extensive and detailed presentation, have a number of questions, even though it is fairly late.

Could we leave that Vu-Graph available with those conclusions and recommendations, because I am sure some of us may have a question or two.

Mayor Wise has another commitment and I will ask him if he has some questions first?

Mr. WISE. I have a luncheon commitment with my friendly Congressman, and when a Congressman calls upon a mayor, he responds, and I will have to get there as near time as possible.

Really I don't have a question, but I wanted to mention this for the record more than anything, because I think in the general area of environment and aircraft, as it were, that this should be referred to.

Boeing probably is to Seattle what Ling-Temco-Vought and Texas Instruments, all aerospace type of interests, are to Dallas and the economy. I consider myself an environmentalist as well as a mayor, and anything that has to do—and I think this is where I think these observations should be made—anything that has to do with the health of the aerospace industry or as I say, Boeing in Seattle and those other companies in Dallas, has to be seriously weighed as to the consequences of the economy of the overall community.

That is one reason that environmentalists who sometimes talk in oversimplified terms of—we are going to have to shut down a business or going to have to suppress the productivity of a business—talk in very dangerous terms indeed. Because you are

talking about, as has already occurred in Seattle and to a lesser extent I am happy to say in Dallas—has a tremendous influence on the economy affecting every citizen in the community. And if any of these, the productivity of any of these kinds of companies really becomes extensive—that is if the lessening of it becomes extensive, then you are talking about mouths to feed and jobs and clothing and very human things that an elected official has to be concerned with, and I think we focus in on that on the recent SST controversy.

Had the SST already been in production, say, in Dallas, for example, it's cessation—and I am not speaking to whether I favor or disfavor its cessation—but its cessation would have had an overwhelming impact over the economy of our community. So I just wanted to mention that. It has no direct relationship perhaps to this except I think it should be mentioned in the overall picture, because there is no doubt about it; I don't think most people, and especially environmentalists, don't quite recognize what an impact businesses such as Boeing mean to Seattle, for example.

Dr. MEYER. Thank you, Mr. Mayor, for keeping your feet solidly on the ground while we are engaged in problems of aerospace.

Before I ask the rest of the panel about questions, let me ask you a very straightforward question:

You have outlined a very comprehensive industry effort, and indicated a substantial investment not only by industry but by the Federal Government in this problem. All through this, I read—maybe I read wrongly—but I read in what you said, a sense of frustration. That sense of frustration arises because something else is needed.

I would like to ask you very succinctly, what do you think it takes to mobilize a program to arrive at a solution to this problem? I mean, we have an interagency aircraft noise abatement program participated in by the principal elements of the Federal Government which is doing as reasonable and, in fact, as effective a job as it can within the existing staff limitations.

The industry is participating with that effort. We have, in addition, as we'll hear later today, other segments of the industry working in this regard. What else, from your viewpoint, is needed?

Mr. BLUMENTHAL. Well, I think I would like to ask Mr. Russel to answer that in some detail. From my standpoint, I think what is needed primarily is a tremendous amount more applied research, which has, as a starting point, some of the more fundamental research to understand what the acoustic picture is well enough for us to write equations and be able to predict ahead of time without having to do the cut-and-dried research.

Mr. RUSSELL. I think I would second Vaughn's comment and for a completely detailed answer to the question, in the paper that we prepared on the last past, there is a recommendation in two parts.

The first part is under a heading called "Basic Research," and the second part is under a heading called "Applied Research, Retrofit Configuration Development."

I think in view of the fact that this page is in the report, I won't go into it in great detail except to say that what is pointed out here is in the area of basic research, and this is understanding, as Vaughn has said, as opposed to cut-and-dried frustration engineering.

It is a level of effort over and above what we are doing today on the order of \$10 million per year, covering five areas, the areas listed here. The include turbo-machinery, source design for low noise, work in jet exhaust noise understanding, reemphasizing again what we have emphasized in the presentation, additional work in acoustic lining and new materials for sound suppression, work in community assessment and work in propulsion performance and performance losses.

These are headings under "Basic Research."

In the second area mentioned in here, it simply emphasizes an increase in the amount of dollars and time that is being contributed now to retrofit configuration development. The recommendation that is detailed in here is of the order of \$20 million additional funds to cover work similar to what we are doing today on the 727 and 707 airplanes under our cost sharing contract with the FAA.

Dr. MEYER. Let me put my question a little differently: Certainly other elements of the Government when faced with problems like this have adopted what is known—and I am sure the gentlemen from the aerospace industry in Boeing will know exactly what we are talking about—as the forecast system. Boeing participated in an effort by another element of the Government called Project Forecasting, in which the industry and people like Rand and people from educational institutions got together, took a look and asked what is the problem we see out here now and what will it be 5 and 10 years ahead from now? How do we mobilize all of these various resources?

The question I am getting ready to ask you is, Are you satisfied with the present institutional arrangements and thus think only money is needed, or should we try to adopt a new approach, taking into account that the public is not going to be content to live with existing noise levels under FAR-36, but will demand reductions?

Are you satisfied that all we need is money and time? Or is there some other new approach in trying to mobilize the Nation's effort to deal with the problem?

Mr. RUSSELL. I will try a comment on that. I think money a time is essential. Without it we are not going to progress any faster than we are today and that, apparently, is not good enough by our studies and everyone else's. I think an increase in emphasis on systems approach, a total approach, a single Government agency to direct and guide the total attack on the problem is one area that probably could receive increased emphasis. I think all of the elements of the problem are being worked. I guess my personal opinion is that all of them need to be increased in depth and scope and then perhaps pulled together to a more unified attack on the problem.

Dr. MEYER. You have answered my question. Dr. Bolt?

Dr. BOLT. Yes.

First, as a person who has worked in this field for more than two decades I would like to say that in my view you have given a most impressive history in the extensive and difficult work toward quieter aircraft, and I think that is very commendable.

I would like to ask a brief question first in basic research, a kind of theoretical question and then I have some practical ones. I am thinking about some of the recent theoretical work by Wibner, Meacham, and others, giving us some new insights into the mechanism of the jet generation, where they look at the pressures and relate them to the rate of noise as distinct from the earlier, lighter approach of looking at the velocities, relating them to other things.

I wondered if you have looked at this and whether you think it may be helpful or is being helpful in giving some new ways of looking at imperial results you have obtained or perhaps suggesting new ways of looking at the problem of reducing the noise from the jet itself.

Mr. RUSSELL. I would like to say that we are in the process of studying and looking at the problem and I don't think we really have a hard feeling at this point in time what it is going to mean in terms of solving the problem.

Dr. BOLT. You have started looking at this pressure approach?

Mr. RUSSELL. Yes.

Dr. BOLT. The second question, just in kind of relating between, say, a ground measurement on a particular test such as you show, 20-decibel reduction, with the inject or shroud and so on—in general terms how would you relate, say, that 20 decibels to the overall effective perceived noise decibels when it goes into flight, or is that question really answered by one of the graphs that you show that has the black areas and then the shaded areas?

Mr. RUSSELL. It is an extremely complex process, because, as you are aware, of the multiplicity of noise sources that are on the engine, the inlet, fan discharge, the jet exhaust, and then the addition of one device to work on one of, for example, three sources, in what you measure on the ground and then try and estimate what that device is going to do in flight, it is a complex analytical process to come up with that estimate.

Let me answer the question by saying that at this time we are not certain what we are going to obtain in flight, especially because of the complexities of a two-flow fan engine with jet exhaust suppression. No one has ever flown one before; we haven't. We don't know what we are going to get, that is the reason for the flight test program.

The black bars and even more specifically the cross-hatched bars on the chart represent our current analytical estimate of extrapolating ground test data similar to what we showed through this complex process to a flight test estimate.

Dr. BOLT. Mr. Blumenthal?

Mr. BLUMENTHAL. I might say also in that, that there is considerable disagreement in the technical fraternity today as

to whether we are going to get as much benefit or more or less benefit than what we have shown.

Dr. BOLT. Is part of the question the uncertainty as to what the actual motion through the air at traveling speeds may do?

Mr. RUSSELL. Yes.

Mr. BLUMENTHAL. Yes.

Dr. BOLT. Where you were describing the various acoustical materials inside, would you want to say a little bit about the nature of the materials that would withstand the temperatures and other environmental factors? What types?

Mr. BLUMENTHAL. The materials that we have used generally in our inlets are either perforated aluminum sheet, backed up by honeycomb, with an impervious back section to make it into a sort of pseudo-Helmholtz resonator; or it has been a fiber glass material with a porous face sheet, mounted to honeycomb material with a porous face sheet, mounted to honeycomb material, again backed up by a face sheet.

Some of these materials are tenths of an inch thick and others get up into 2 and 3 inches thick depending upon the character, frequency of the noise, that we are trying to attenuate. In the fan ducts, that same kind of material can be used because in general the temperatures are reasonably low. As a matter of fact, we have had flying on American Airlines and on TWA two different types of acoustic material for well over a year in service to prove the durability and reliability of the material. Not hot-tail sections, such as shown on the JT90 or on the tailpipe of the 727 that we have recently certified, we have a perforated stainless steel sheet with metal honeycomb, braced or welded. And either of those get to be fairly expensive types of installations.

Dr. BOLT. You have mentioned, of course, the great costliness of developing and fitting and flying these devices, and the weight increases, payload decrease. I wondered if you have—I don't know how to ask this question, quite; it is a complicated one.

I wonder if you have tried to reflect the likely estimated total cost increase in planes that are sufficiently quiet to meet, say, present standards in terms of the number of cents increase or percent increase in the ticket that the flyer buys to fly on the airplane, assuming that this cost in some sense of a way is passed on to the customer.

Now, I realize there right away you may have to make some assumptions as to whether the original capital investment is underwritten by someone else, but in one way or another could you say a little bit that would give us a feeling? Are we talking about 10 cents more per ride, \$10 more per ride?

Mr. BLUMENTHAL. Being somewhat of a public coward, I would like to duck that one to a certain extent. However, there are some things that can be said.

The Rohr report, which many of you are aware of under the auspices of the FAA came out about a year ago, and did give some indications of what increases in fare might be. Some of us found considerable fault with the details of that report. I am not sure that we in the manufacturing end of it were able to find a gross fault with the level of the costs shown in that report. We do feel quite strongly that there should be a com-

bined airline-Government analysis of what this cost is, such that things that were not included do get proper recognition.

I might say that a couple of examples, in the 707, the type of an installation that we quoted in the NASA contract resulted in a range loss of 200 miles. That is not very important to the airline that doesn't want to fly a maximum range. It is extremely important to the airlines that has some city pairs that require that kind of range and he has to make a stop on the way. It can really knock out profitability for a very important segment of his operations. That kind of stuff was not properly included. I have not seen it in the airline analyses either.

Dr. BOLT. Are you now taking some steps to add this aspect into the economic analysis?

Mr. BLUMENTHAL. We are not because we do not feel we know enough detail about the various airline aspects to be able to adequately cover that portion. We think that is something that the Government and airlines combined should enter into.

Mr. BOLT. It would certainly seem like the kind of question that the general public should get some—

Mr. BLUMENTHAL. One of the very large swingers on this cost in terms of DOC, for instance, is the question of who pays for the depreciation costs and who pays for the cost of the money associated with putting this kind of treatment aboard. Neither of them have been adequately handled in the past and they are quite overpowering.

Mr. BOLT. I would like to ask a quick question related to safety. You have described a modified procedure, cutting the glidepath down to from $2\frac{1}{2}$ to 3, moving the interceptor out, gaining a nice reduction.

How does this relate to the safety of the aircraft? Is that amount of change in an operational procedure making what the operators would consider to be a significant increase?

Mr. BLUMENTHAL. Simple increase in interceptor altitude, of course, involves no safety. I believe increases in glide slope up to 3° likewise would not involve safety.

When we get into steeper approaches or approaches that require—that we have suggested that involve speed leadoff, lower thrust on the approach, delay of flap and gear extension, there is a need for additional equipment to be installed in the airplane.

And when we get into the really steep approaches like 6°, something of that sort, which we think will come with time, there is a very definite need for sophisticated equipment in the airplane and to some extent on the ground to absolutely assure ourselves that there is no degradation in the safety.

We began flight tests of steep approaches under a contract to NASA some 4 or 5 years ago. And we have proved fairly conclusively that the pilots could fly steep approaches providing that they had additional equipment in the airplane that told them where they could—where they were and what they were doing. This equipment—without the equipment we could make the normal glide slope intercept at 800- to 1,000-foot altitude. With the additional equipment we could virtually bring the airplane down on the deck.

Dr. MEYER. I hope we will hear some more about that from Mr. Kolk of American Airlines, who will testify this afternoon.

Mr. BOLT. Let me ask a quick question about criteria, the present set of criteria that we are using to try to relate the noise characteristics of the aviation operations to the responses of the community. What is your general feeling about these criteria, their adequacy, or about further questions that should be asked about what should be done in this general area?

Mr. BLUMENTHAL. Some of this gets emotional. And so in this case I will speak for myself and let Mr. Russell speak for himself.

I personally feel that the effective-perceived-noise-decibel type of definition of noise has some very serious shortcomings. However, it is the best thing that we have at the present time and until something new comes along, there is no alternative but to continue to use it.

As an example of what I am talking about there, in terms of absolute noise levels, the 727 airplane, particularly advanced 727, is not particularly noisier, if as noisy, as the DC-10 airplane. I think the quality of the sounds, however, are different and the quality is not properly showing up in the effective perceived noise decibel relationship.

This is a field where very much additional research needs to be done and until it is, effective perceived noise decibel is what we have so we should not abandon it.

Mr. RUSSELL. Just a few comments in the same direction. I think it is pretty well established and accepted by most everyone in the business that there is a need for a tremendous amount of additional research in this area. We see it in particular as aircraft designers are being called upon to compromise the designs of real hardware as directed by a unit that we have real qualms about its absolute validity in relationship to people, reaction, response, and acceptability.

I am not particularly worried about the low-frequency rating on PML and EPNdb, and I think we see this in terms of what Mr. Blumenthal just said of the way EPNdb rates a jet-dominated engine of the new high-bypass variety.

EPNdb, as an example, does not pick up buzz saw noise with the high-bypass airplanes and yet it is obviously a noise quality or characteristic, how good or how bad it is is hard to say. But it should be in the unit probably, and should be assessed to guide the design process to either leave it there or try and do something about it, for example, a buzz saw.

I think I endorse what Vaughn has said. There is a lot of additional research needed in the units that we use and then even more important, what is the criterion of acceptability. For example, with STOL airplanes in communities today.

Mr. BOLT. Thank you very much.

Dr. JOHNSON. I have many questions I am not going to ask because of the time limitations which we have and also due to the fact that I think some of them may not help us much in what we are trying to achieve. But my curiosity will not let me go without asking one question.

How many complaints did you receive during the 1960's from residents because of your noise-quieting program disturbing them?

Mr. BLUMENTHAL. I can't tell you how many, but it was enough such that we have moved virtually all of our high-noise-impact activity from the north end of Boeing field to other locations. We have one noise facility up north of Everett, and we have another noise facility in an extremely remote area down at Boardman, Oreg., where these tests are run. Without them, we would, I think, be dead in the water. We could not continue to operate at Boeing field.

Mr. ELDRED. I will cut my questions short.

Dr. MEYER. If the panelists have any questions of real significance, we can put them in writing, and give them to the witnesses and request they respond in writing.

Mr. ELDRED. And on your future 727 and 737, after you have gone into production on the certified airplanes, will your future productions of those two models be of that type, meet the certification levels or will that only be—will that be dependent on the airlines specification?

Mr. BLUMENTHAL. That is completely dependent upon the airline.

Mr. ELDRED. You might be building advanced 727's or the current model 727's, depending upon the specifications?

Mr. RUSSELL. Yes, sir.

Mr. ELDRED. That is maybe a little bit hard for you to guess at the present time. You might have a better gut feel of it, though. What is your best estimate of what can practically be achieved in retrofit on 737's, 727-type, JT8D-type engines in noise reduction?

Mr. BLUMENTHAL. At the present time I would say we would have to limit the retrofit to fan treatment only. The type of configuration that we have described here, and which is in production on the 727—the 737 still has to be proven out. Until we have gotten gun shy enough on this acoustics business, until we have completed the FAA certification tests, we really don't know where we are.

Mr. ELDRED. What sort of—where do you stand with the thrust penalty now, percent thrust lost per decibel?

Mr. BLUMENTHAL. On that fan treatment, we are merely putting a rougher surface on the inside of the air passages on the 727, and so the thrust loss is negligible.

The weight of installation is sufficient that it deteriorates the total range of the airplane something in the order of 25 miles. On the 737, the fan treatment may require an inlet ring. We will be testing both with and without. And when we put anything in the inlet in the form of a ring with struts and inter-sections, there is a thrust loss there.

If we do not need the ring, I suspect the performance deteriorations would be somewhat in the same order of magnitude as those on the 727 with an inlet ring, since the losses are fairly small. I would say there would probably be a 50 percent increase in range degradation.

Mr. ELDRED. What about your exhaust nozzles?

Mr. BLUMENTHAL. If we put jet suppression on in the form we have been working with, there is a deterioration in takeoff thrust. It becomes very significant, particularly on the two-engine airplane, and engine characteristics have to be considered.

I believe that on the 737, although I have to say that we aren't really investigating this in detail at this point—I believe that we would probably get involved in an increase of thrust on the engine at the same time we put something on that sort on.

For instance, most of our 737's at this point have JT8D-7 and JT8D-9 engines. Only a very few have 11's or 15's. I think we would have to go to a JT8D-15 engine in order to put something of this sort on if we can get it to go on at all.

Mr. ELDRED. Just to make up the thrust you are losing?

Mr. BLUMENTHAL. To make up the loss of thrust, and to make it possible to fly out of a field that is not limited, where we are not limited on field length.

Actually on the 727, I mentioned that the addition of both jet suppression and fan suppression would cost us somewhere between 8 and 15 percent in range without including the allowance for balance on the long-bodied airplanes. That was assuming that we were not limited on field length. If we get limited on field length, the reduction in thrust with that installation requires that we off-load fuel, and performance loss becomes considerably greater, perhaps 20 percent.

You can see why I say we are certainly not satisfied with that type of treatment as yet. We think that we have gone along way towards taking a step forward. It does provide an option, but at this point it is not a very attractive option.

Mr. ELDRED. One last question. You mentioned no one should do anything about noise reduction until you can do something of significance to the real problem in the community. I was wondering if you have any comments on the adequacy of the 3-point measurement system in FAR-36 as a design objective or whether you would recommend additional measurements or another approach?

Mr. RUSSELL. I think for conventional airplanes the 3-point system is an adequate approximation of what the community situation is you are trying to certify for. When we consider STOL airplanes, STOL airplane design criteria, we are having an awful lot of trouble with the three-point or any point system.

Today our thinking is leading us in the direction of a footprint kind of system for a STOL airplane. I think in general for conventional airplanes I would hate to see the system any more complex or costly than it is today for certification, for example, for a 747 or DC-10.

Mr. ELDRED. On the STOL, are you including a cruise spec in what you are thinking of?

Mr. RUSSELL. Cruise spec in terms of performance?

Mr. ELDRED. As far as noise is concerned.

Mr. RUSSELL. The question has come up at this particular time. We are not emphasizing that requirement nearly as much as we are the airport-community boundary problem.

Mr. ELDRED. That may turn out to be important, though.

Mr. BERLAND. Your data presented today have dealt mostly with civil aircraft. I wonder if you could give us comparisons to noise produced by the military aircraft that you are involved in or perhaps military designations of some of the civilian aircraft—but there are other kinds of aircraft that you are involved in that produce a great deal of noise that you haven't addressed yourself to.

I wonder if you could.

Mr. BLUMENTHAL. Two airplanes, I guess, that are most significant at this point, that we are associated with, are the KC-135 and the B-52. Both of those airplanes produce considerably greater noise than anything we have shown for the commercial airplanes. The KC-135, I believe in general have pure jet—let me back up. I am not sure that I know what engines they all have on them.

They have no jet suppression and therefore are considerably noisier than what we quote on the other airplanes. I don't know what the noise levels are. Do you have a guess estimate?

Mr. RUSSELL. Just that they are higher, that is all.

Mr. BERLAND. There was no requirement or specifications from the military to put on these suppressors; is that right?

Mr. BLUMENTHAL. No, sir.

Mr. BERLAND. Have you been involved at all in any production of any quiet airplanes for the military?

Mr. BLUMENTHAL. The military is becoming more interested in noise reduction and are letting some contracts at this point, research contracts. I can't say we have been involved in any quite full scale airplane work.

Mr. BERLAND. It seems to me from what you have said in your testimony here that you have spent a great deal of time, effort, money, creativity, in trying to add on, correct, and otherwise work around what you are being handed, which is essentially a very noisy package. You are not manufacturers of engines, is that right?

Mr. BLUMENTHAL. That is correct. But I would like to qualify that a little. Of course you know back in 1934 the Government decided we should not be building engines and airplanes at the same time. So we were prohibited by law from doing that. However, that doesn't prohibit us from getting into Pratt & Whitney and GE, getting into their hair to a greater extent than they appreciate sometimes.

We have a small scale fan rig, 12-inch diameter, where we have done quite a considerable amount of research work involving blade loading, involving what could be done to quiet the noise that comes from fans. We have done much of this work in cooperation with GE and Pratt & Whitney. It has not been in a vacuum at all. But we are working cooperatively with both of those companies, very actively to encourage them and to assist them wherever we could to the extent that we are not engine builders, to quiet some of the noise at the sources.

Dr. MEYER. I think we are going to hear more on that from Pratt & Whitney this afternoon.

Mr. BERLAND. It seems to me if I were an airplane manufacturer and I wanted to have a quieter airplane, I would first

sit down with the engine manufacturers and other suppliers and say all right, let's start off and build a quiet airplane. I would not spend since 1958 to 1972 adding on and trying to modify structure, airframe and nacelles to make the airplane quieter. There are very few airplanes that the military has produced—they have said we want a quieter airplane, and they have produced it.

I think the other thing I would do, I would say to the supplier, or if the person that was purchasing my airplane didn't say it to me first, I realized his responsibility there—I would say I not only want you to produce some pounds of thrust and produce such speeds, other specifications, but also give him a maximum in decibels.

Mr. BLUMENTHAL. As a matter of fact, virtually all that you have said there is included in our engine specifications today. This is a very competitive activity between the various engine manufacturers, and both we as airplane manufacturers and the airlines as the users take a very active part in defining the noise levels in our basic specifications given to the engine manufacturers.

These are noise levels in our basic specifications given to the engine manufacturers. These are noise levels we define based upon an appreciation for what we think they can accomplish. But they are quite stringent.

Dr. MEYER. I would like to follow up on that a minute. Am I to interpret from your statement that Boeing has, in its establishment of competition for engines to put on its airframes, said to an engine manufacturer, one of the design considerations is that on a maximum noise axis, 45°, say, the overall sound pressure level at a distance, 500 feet, 1,000 feet, or whatever shall be such and such? Is that the criteria you are using?

Mr. RUSSELL. On the 747, for example, there were engine noise level specifications that were negotiated and agreed upon with the supplier, and this included a variation in allowable noise level with power setting, which encompassed landing approach as well as cutback as well as takeoff power setting.

It included component contribution specifications, be it inlet or aft duct fan noise, and it included both ground specifications as well as flight specifications.

In other words, I don't see how the two of us could have attempted to tie down what it was we were selling and buying any more than we did with a specification of that sort.

Mr. BERLAND. These specifications, were they in response to the requirements from the FAA? What the law requires?

Mr. BLUMENTHAL. The specifications for the JT9D for instance came about well before FAR-36 legislation came into being.

Mr. BERLAND. If the legislation requires lower ceilings than the engine manufacturers have set—

Mr. BLUMENTHAL. The screws will be tightened.

Mr. BERLAND. No one is anticipating the next appliance of the screws, though. There is some talk about the SST. I don't see anywhere here in the research data, that you have done any research on sonic boom per se, have you?

Mr. BLUMENTHAL. Yes, we have done an awful lot of work on that. I am not prepared to discuss it in any detail. There is a substantial amount of it in the literature.

Mr. BERLAND. On your three-engine jet, 727, you talked about the difference in noise on the ground depending on the placement of the engine on the airframe. You said the 727 took some shielding effect on the wings. Was there any difference on the noise generated by the engine in the fuselage in the tail in comparison with the two engines outside?

Mr. BLUMENTHAL. The aft noise is essentially the same. The forward noise is considerably different.

For instance on the treatment we have certified recently we have not had to add anything to the center engine inlet. However, as we go on towards further reduction of the overall noise level with the jet suppression devices we find that the center engine inlet will have to be treated. I am not sure that answers you. There is a difference there.

Mr. BERLAND. Right.

Dr. MEYER. Thank you for being so candid in your responses to some very pointed questions.

At this point we will recess.

Mr. BERLAND. Mr. Chairman, I feel I have to rebut Mayor Wise's remark, my fellow panelist, in blaming the environmentalists for the economic trouble of Seattle and Boeing. I think he ought to blame it where it belongs, on lack of diversification and poor management, not on environmentalists.

Dr. MEYER. That is fully noted on the record. I am sure you and Mayor Wise can have an exchange on that away from the official panel.

At this point we will recess for lunch and reconvene promptly at 2.

I must remind the panel and everyone that we have to vacate this room promptly at 5 so we will have to proceed promptly at 2 with our afternoon's witnesses.

(Whereupon at 1 p.m., the hearing was recessed, to reconvene at 2 p.m., this same day.)

AFTERNOON SESSION

Dr. MEYER. All right, ladies and gentlemen, we will reconvene for the afternoon schedule.

I have a witness which I will bring in now. I don't necessarily want to break the train of thought with the aircraft business, but I will ask Mr. Sheldon Samuels, the director of occupational health, safety, and environmental affairs of the AFL-CIO, if he would come forward at this time, because I know he has a rush commitment and has to leave very soon.

STATEMENT OF SHELDON SAMUELS, AFL-CIO

Mr. SAMUELS. Thank you very much, Dr. Meyer, for the courtesy and for the opportunity of meeting with you again.

We think it is very important to present before the Environmental Protection Agency on behalf of the 61 unions and 6 million families we represent, our concern for noise.

Some of the threads of our earlier dialog presented in Chicago on July 28 in this series of hearings need amplification.

Our Chicago testimony underlined a basic principle of environmental economics: pollution is a subsidy of the design, production, distribution, and disposal of a product or process. The subsidy is paid by those whose physical and financial resources are wasted, whose property is adversely affected, whose health is ruined, or even whose hearing is destroyed. There is very little difference in effect between such a subsidy paid in the workplace or in the community.

The subsidy has been a fact of the industrial revolution magnified by the rapid pace of urbanization and aggravated by a lack of compatibility between categories of sources—such as transportation—whose defects of design result in noise and other forms of pollution and the changing life styles of the densely populated societies. In 1920 about half our population still lived on farms. Today our total population increase is taking place in cities. We have become an urban nation. But we continue to produce goods in factories whose design and often whose actual construction dates back to the turn of the century. The reason lies neither in technological incapability nor in creative ineptness. Rather, it lies in an attitude of doing least rather than best, of doing what must be done to meet short goals alone rather than of making additional allowances for future realities.

Even the short history of the Occupational Safety and Health Act of 1970 provides us with examples. The act has enabled an interim noise standard of 90 dbA to be enforced. This standard, despite its inadequacies, if enforced, would mean that 10 to 20 percent of the exposed workforce will undergo a substantial loss of hearing. This is a situation that would not be tolerated in the community. Yet it is expected of the worker, they are paid, says the scientific literature, to take the risk. How can man ever be paid enough? Does the worker really have a choice? Generally even this slack requirement is being ignored. Where an attempt is being made to meet the standard. The primary means is through personal protective equipment such as plugs (seldom fitted and thus, useless) and muffs. And in response to some of the testimony I heard this morning, I would like to point out

that it is wrong to think that hearing is simply a health problem. You will recall, Dr. Meyer, in Chicago, we provided ample testimony to show that noise is also a safety problem, and that in fact a man in a noisy atmosphere with pollution can lose an arm or hand or his life. A man who must wear muffs in a blast furnace room is himself a safety hazard. And, as a matter of fact, the recognition of this is reflected in the OSHA regulations, which require engineering controls be taken as a first measure and that personal protective equipment and administrative controls follow. Some control by administrative means, and that was described this morning, I won't amplify that, has certainly been attempted. But seldom are design and engineering changes made to meet the standard. I am sure that the consequence is making the hearing aid industry prosperous. The total effect is unknown. Even where audiometric evaluations are taking place, the results are generally being kept from the worker and his union.

As more and more workers become involved in the self-enforcement provisions of the act, this situation will change. Inspections will cause the existing standard to be enforced. The standard itself will be tightened in terms of its numerical values, allowable remedies, and employee access to the records of biological monitoring. As a result, we are confident that the subsidy will decrease both in the workplace and in urban areas where noise spillover occurs. Meanwhile great segments of American management will go its merry way designing and building plants and processes based on the currently inadequate soon to be replaced code and using little or no enforcement. They will spend their time fighting the inevitable changes, settling for the cheap profits of short-run delays and oblivious to what may become massive, long term losses. Then, when the day of payment comes they will cry poverty and threaten to close down and leave the community. They will complain about regulations being too difficult to meet because they are in flux, they will shout at the paperwork and decry law enforced by a myriad of governmental agencies. Yet they knowingly invest in inadequately plants, they are responsible for standards which must be changed to protect health, they create paperwork because they do very little voluntarily and they are faced by a multitude of agencies because of their divide, weaken, co-opt and conquer approach to government.

This has been the pattern in water, air, pesticide, and radiation control. It is the pattern already taking shape in occupational health and noise regulation. But it is a pattern which increasingly we cannot afford. As we speak this morning, or this afternoon, there are industries whose past record of environmental mismanagement endangers the long-term economy of this country and the very life of the communities in which they function. Since they have indeed reached a condition in which survival may mean a continued dole in terms of the pocketbooks and anguish of their employees and of the community, then we, their debtors, have a right to examine every detail of the debt. Bankruptcies lose all claim to managing their own affairs without the participation of those to whom they owe a debt.

The problem of noise in the plant and the community cries for solution. Like all environmental problems, the first step in the solution lies in the development of a sound national plan. In view of continual pleas of financial and technological poverty we are suggesting that government, labor, and community organizations as well as industry, participate in the development and implementation of such a plan. Hopefully the plan would become part of a broader effort to assess the impact of environmental needs on industry and make provision for predictable changes. It is absolutely essential that there be planned, orderly replacement of the old plants and processes with the new with a minimum of economic disruption. Furthermore, the burden of environmentally required technological change must be borne not only by the worker but by the whole community on whose behalf the change takes place.

Change is no stranger to the worker. He can master the new technologies that will replace the old as we learn to cope with ways to produce our goods without pollution. In effect, we are confident that, if necessary, new means of livelihood can be created. But this is a task too important to be left to the initiative of the industrial segment of our society alone.

To lay the base for such a plan, we propose an inventory of noise problems in a broad spectrum of industries conducted by a task force of the three agencies with responsibilities in this area—OSHA, NIOSH, and EPA—and in collaboration with labor and industry.

We recommend that the sample include industries where high noise levels currently prevail such as transportation, printing, textiles, and metal fabrication.

Plant size should be viewed in terms of current line-use conflicts. Interior and exterior design elements related to noise controls, such as structural shape and construction materials need to be determined. The manufacturing process itself ought to be viewed in terms of actual noise levels, and the isolation of point sources.

The survey should include an analysis of how current corrective technology may be applied and the cost of such correction related to the value of total production and what noise levels could then be corrected.

Operational means of control need to be analyzed: production practices, maintenance, machine substitution, process substitution, vibration, dampening, reduction of noise transmission, isolation of sources, and of course isolation of operators.

In regard to these operations, we need concrete basic data on capital and operating costs. A key element undoubtedly must be the environmental economics of each plant, including age, plan of process, replacement cost, ability to absorb structural changes mandated by other environmental demands, such as adequate inplant ventilation, maintenance of environmental controls, and other factors.

Finally, the inventory should be designed so it could provide the scenario for testing the feasibility of the control operations in terms of their effects on productivity. This kind of information will not only end, hopefully, environmental blackmail, but

more important, will enable us to begin to function in a rational manner.

Participation by labor in such a joint project, we think, would be important in terms of providing an additional source of information. We have our own data-collection capabilities and most certainly manpower.

Thank you very much.

Dr. MEYER. Thank you, Sheldon.

Let me be sure I understand one thing about this proposal, which is a very significant one, I might add. You are not just homing in on noise in this, you are talking about a real environmental inventory?

Mr. SAMUELS. I think we need to do more of this in the other areas, media, as your Agency likes to call them. I think noise is a good one to begin with, and for that reason, we would like to propose beginning with noise.

In air and water there is already some work like this being done, in fact has been done for many years, as you know.

Dr. MEYER. Right.

Mr. SAMUELS. But we have really tried to find out what is going on in a very broad sense in noise, and we find very, very little. And the kind of work, inventory of sources, that was traditionally done in air pollution and water pollution control doesn't seem to have really begun, and even though this is tedious and time-consuming and very expensive work, I think you will agree that it was very worthwhile in those days to go through those steps.

Dr. MEYER. Well, I think before I ask the panel if they have any very brief questions to ask you—I think this is very significant, because actually, in spite of all that rather extensive work you described, it wasn't until the decision was made to institute the permanent system on a more aggressive basis that we got any idea as to what the number of actual ways water outlets in the United States were. There was absolutely no way of getting any idea on this, and I think this sort of sampling inventory that you are talking about would be a logical extension in some of the work that the Agency has done in preparing its work to Congress, but we didn't get into this department within the industrial establishment as you suggest.

I think this is one idea that we will have to take a good look at in order to attempt to develop a useful approach. Because it does spill over into the environmental economic business that you are talking about.

I will ask on my right if you have any questions or comments.

Mr. BERLAND. Yes. I know that unions have been active in past years in terms of the environment, like the coal mines. I wonder, would it be realistic and beneficial as part of negotiations and then as part of contracts between labor and management to include noise protection and/or reduction of noise in the environment in the industrial situation?

Mr. SAMUELS. You are talking about the workplace?

Mr. BERLAND. The workplace, right.

Mr. SAMUELS. This is a matter of contract negotiation. It hasn't been terribly successful and that is why there is an

Occupational Safety and Health Act. Strong unions find that it is a good tool, and they find that what the Occupational Safety and Health Act has really done is give them an additional means by which they can correct a situation, and of course the stronger unions will continue to bargain for strong inplant environmental controls through that process.

But we can't depend on that. For one thing, you don't want to make as a matter of bargaining the numbers of ATLV, threshold limit value. That is not something that is negotiable, really. The things that are negotiable are procedures for grievances, and this kind of thing, and virtually every organized plant has some grievance procedure in their contract.

So they have the means to go that route, and that route is—it has not been entirely unsuccessful. But I don't mean to leave that impression. It has resulted in many industry cleanups, particularly where there is a good employer-employee relationship, by the way.

The experience of the last 7 months in terms of complaints handled by the occupational safety and health administration indicate that the unions want to deal first with management before they call government in. And so the contract very often provides a medium by which they can work with the company. Does that answer your question?

Mr. BERLAND. Yes, but what you are saying is that you haven't negotiated the environment, so to speak, the conditions of it. What you have negotiated are the procedures for grievances about the environment.

Mr. SAMUELS. You do negotiate the environment, you know, but the question is, to what detail can you go. For example, do you think that it is fruitful to sit down and negotiate what we think of as the American Conference of Governmental and Industry TLV?

I think there are about 400 such substances, that is not negotiable, as far as we are concerned. That is something that must be followed by law.

There is no point in trying to waste any time negotiating about that. Do you see what I mean?

Mr. BERLAND. You have a law now but you didn't have a law before.

One more question: Have the unions been active at all in litigation involving recompense, Workmen's Compensation, for loss of hearing on the job?

Mr. SAMUELS. In those States—it is a very uneven thing.

Mr. BERLAND. I know that.

Mr. SAMUELS. But in those States where it is covered under workmen's compensation, of course, they have. That is a primary activity, particularly at the local union level, and a primary activity at the municipal or metropolitan and State labor bodies. Workmen's compensation is not a successful means of really taking care of this problem.

First of all, it is after the fact, and secondly, it is a very long, drawn-out procedure.

Third, in areas such as we are dealing with here, with noise, where the effect will take place over a very, very long period

of time, and where a worker may be mobile, it is very difficult to ascribe a particular condition of a particular person to a single plant.

Now, with the rising din of noise in our cities, many employers quite rightfully can say, "Well, gentlemen, it wasn't just the noise in the plant." What proportion will be borne by the community would be a problem.

Mr. BERLAND. We were talking this morning about economic pressures upon industry, employers, and certainly if an employer—if there were a great deal of litigation to recompense workers who lose their hearing on the job this would be reflected in the amount of insurance that the employer would pay, and if he could right the situation in the environment and/or provide protection for the hearing he would have a lower fee to pay in his insurance, and that forms a sort of economic pressure.

Mr. SAMUELS. I would agree, but it is kind of unrealistic in view of the fact that most workers are never tested, and when they are, only a very small portion of them are ever given the results.

In Chicago, for example, we had some testimony from machinists from Benton Harbor. Now, I am sorry they didn't enter into the record, but the president of that local wore a hearing aid, and he thinks he went deaf on the job. But he can't collect because he can't prove it.

Mr. BERLAND. I don't think we have an audiologist on the panel, but I don't know that a hearing aid is the proper remedy for noise levels; I don't think it is.

Dr. MEYER. Any other questions, Ken?

Mr. ELDRED. One quick one.

You mentioned you felt the 90-dBA limits are awfully inadequate. Have you recommended any lower limits?

Mr. SAMUELS. We are working on a proposal to see—what the act calls a 6-B proposal, occupational safety and health, for a limit much lower than that. If you know anything about the history of that number, you will recall that the staff scientists' recommendations of the Departments of Labor and Health, Education, and Welfare, was 85. The number was made 90 on a purely political basis. And we are looking at the staff recommendation which was 85, and we are looking at some recommendations that have come to us from our own consultants for a much lower level.

Mr. ELDRED. Thank you.

Dr. JOHNSON. You are the second witness today who has alluded to the enforcement on an individual basis. You referred to it as self-enforcement, and indicated it is a foregone conclusion it will come about. Could you tell me how you would achieve self-enforcement of the safety matters relative to noise?

Mr. SAMUELS. And not simply noise but total environmental matters. The act becomes self-enforcing because it specifically provides for participation of the worker in every aspect of the enforcement process. It is a very unusual act, and it enables us, in fact encourages us, to train people to participate.

For example, the act enables a worker without possibility of retaliation to do some casefinding and lodge a complaint. His

protection comes from the fact that if he wishes to, the employer doesn't have to know that he lodged that complaint. It also enables him to bring into the plant experts of his own. Many unions have begun to hire environmentalists, most notably, most recently, the rubber workers have hired a licensed, certified industrial hygienist with many years of experience. And he, in effect, conducts inspections, and if he is unable to get a reasonable resolution of the problems, on a time schedule that suits the union, then he has the Occupational Safety and Health Act as a final recourse.

Dr. JOHNSON. I misunderstood what you meant. I thought you meant you had a way to get the guy to wear earplugs when he was supposed to.

Mr. SAMUELS. I was going to comment on that kind of thing. There is an awful lot of emphasis put on supervision and the worker not wearing earplugs, this kind of thing. It is very, very misleading. I would not wear a muff in a hot room for 8 hours a day, and I would not pick out a pair of plugs from a basket, which is the usual means of distribution, and wear them when I knew that it really didn't cut down on the noise very much. And I wouldn't consider doing any of these things when I knew that my employer was not doing anything to cut down the noise using engineering controls.

Dr. JOHNSON. My question is what would you do, though? You are talking about what you would not do.

Mr. SAMUELS. What we must do is take the concept that is in the standards, namely, use the act to see the employer does whatever he can to reduce the noise and then if the noise is not reduced by that means, attempt administrative means of rotating the men, and if that still doesn't work then of course the men must wear muffs and they must wear plugs, and in our training program we emphasize this. We are, by the way, conducting an extensive environmental training program. The past summer about 100,000 men were exposed to this training, and we are conducting, in cooperation with 10 universities around the country, a kind of graduate school for these men. This will be repeated I hope every summer as long as our resources last.

Dr. JOHNSON. Thank you.

Dr. MEYER. Dr. Bolt.

Dr. BOLT. No, sir.

Dr. MEYER. Thank you very much.

I am going to be back in touch with you about this proposal of a study. Obviously it is going to require coordination between EPA and Labor and HEW, but we would like to talk to you more about this, Sheldon. It is an excellent suggestion. Thank you very much.

Mr. SAMUELS. Thank you.

Dr. MEYER. At this point, then, I should like to continue with our discussions regarding the economics and technology of noise control as they relate to an area of major concern. Since it is a logical sequence, having heard from a major aerospace airframe manufacturer, I would now like to hear from the propulsion side, followed by one of the airline operators.

So, Mr. Kester, of Pratt & Whitney, if you would like to pick up where your colleagues who use your product left us, we would be happy to hear from you sir.

**STATEMENT OF JERVIS KESTER,
PRATT & WHITNEY AIRCRAFT**

Mr. KESTER. Thank you.

I appreciate this opportunity to appear today to discuss with you some of the work that has gone into the reduction of noise from aircraft power plants. I think this is particularly appropriate after hearing what has been done in the installation this morning.

I would like to stress the fact that the problems of aircraft noise were recognized and attacked by the industry long before legislation was thought of or introduced. We have had active noise reduction programs under process at Pratt & Whitney which date well back to before the first jet-powered airplanes were introduced in the commercial service. The results of our programs have gone into reducing the noise from all of the commercial engines that we produce.

In the early 1960's, we contributed to the development of jet suppressor nozzles for the first jet-powered 707's and DC-8's. The fan engine was introduced shortly thereafter, causing a significant reduction in jet exhaust rumble, and also bringing with it an increase in noise from the compressor section of the engine. We had an intensive program in about 1960 to reduce the whine or the tones from the fan, the engines on landing. Changes were made in the engines which have been incorporated in all the fan-powered 707's and DC-8 airplanes now flying.

Noise suppression features for the JT8D which were discussed this morning as powering the 727, DC-9 and 737 airplanes include fan noise reduction features, they include internal mixing of the fan and primary exhaust stream to reduce jet rumble, and they also include the acoustic liners in the engine duct passages which were shown.

Our latest powerplant for commercial service is the JT9D. It powers the 747 and DC-10-2 airplanes. The design of this powerplant was essentially fixed in 1965. Again this was well before noise legislation. Noise was an extremely important factor in the design, and as was discussed this morning, the aspect of noise as a competitive feature in the sale of engines was extremely important at that time, before that time, and is continuing to become more important as time goes on. The research which allowed us to design the JT9D engine to be quieter than the earlier engines, in 1965, actually dated back to the early 1960's, because you have to have the technology to make a quieter design. In order to illustrate some of the facilities that are used and the techniques that are used to reduce the noise of jet engines, I have brought with me today a film. This film also explains what it is about jet engines that makes noise, and as was discussed again this morning, there are many aspects of the engine which do contribute to the noise, and all of these have to be addressed in order to make net improvements.

The film that I plan on showing covers some of the work that goes back to the early 1960's on jet suppressors, and goes on up through the development of the noise technology for the JTD engine. In this period of time, we have estimated that the amount of money that we have spent on noise research exceeds \$36 million. About a third of this figure has gone into basic fundamental research. The need for further fundamental research is clearly indicated. About a third of the money also has gone into supporting noise reduction work on current powerplants such as the JT3D and JT8D. The remaining third or about \$12 million has gone into supporting lower noise from the JT9D installation.

So the work that we discuss in this film I believe will illustrate the problems and the potential for reducing jet engine noise and the technology that was generated as the work in the film will show has been the technology which has allowed us as engine manufacturers to have each succeeding generation of engines be quieter than its predecessors.

There has been progress in this area, but certainly the situation that exists today indicates there needs to be more progress. So without much more ado, I would like to launch into the film, if I could, please.

(Film.)

Mr. KESTER. Thank you. If there are any questions, I will be glad to try and answer them at this point.

Dr. MEYER. I think this was a very good demonstration of the extent to which your company has been devoting attention to this problem. I know there are quite a number of questions that might arise from this sort of a presentation.

In the interest of conserving time and realizing that we would like to get all of our witnesses this afternoon taken care of, we will ask the panel to restrict themselves to one question apiece and then give me the rest of them in writing. I am sure there are more questions, but I am also sure you would not object to providing them for the record in writing.

Mr. KESTER. Fine.

Dr. MEYER. The question that I have is, What design objective approach are you utilizing in this noise reduction effort? Are you trying to get the quietest engine possible or are you simply trying to produce, now that there is something called FAR-36, engines that will, when fitted to airframes, allow aircraft to be certified to the FAR-36 requirements? Which of those routes are you following?

Mr. KESTER. If you go back in time to the time before we had a rule, the requirement was one of exception. The engine manufacturer who could offer the quietest engine that would still do the basic job of propelling the airplane would usually compete successfully. Since the rule has been established of course it has set a requirement that has to be met, and I would say that our experience with the rule at this point has been that it has taken just about everything we knew how to do to meet the rule. In the future, it is very difficult to say exactly what will happen. Certainly to get quieter noise levels, the technology has to be developed to do it.

I think in the aircraft industry may be a little different than other industries in that the products, new designs that we produce, usually have the most modern technology we know about put into them at all fronts. It is not a matter so much of cost or other things, it is a matter of putting in the best you know about at the time. So in the future, the noise levels that we make first of all will be established by the rule, but I don't believe the existence of the rule at all interferes with the competitive pressures that we are under to offer better noise performance than the rule would demand, and thus make an airplane more useful to its eventual operators.

Dr. MEYER. All right.

Dr. Bolt?

Dr. BOLT. Could you describe just briefly in what ways this work that you have been doing at Pratt & Whitney relates to the work being done on aircraft engine noise by frame manufacturers such as Boeing? To what extent do they fly exactly the engines you have, because you have incorporated some changes, or to what extent do they modify the engines, or what combination of those factors?

Mr. KESTER. I would say that we work extremely closely with the airframe manufacturers. For example, in the 747, we have been conducting joint noise reduction programs, where actually we have supplied engines and support the operation of them and they are tested out at Boeing at one of their test sites. Installation hardware for which they are responsible are evaluated in this program, engine hardware changes for which we are responsible are evaluated, and we work extremely closely in this in order to achieve an optimum installation. Because we found that there are things that you can do in the installation that will tend to worsen the noise output of the engine and there are things that you can do in the engine that tend to take away from the noise benefits that you do in the installation. We worked very closely on the 747, we worked closely on the DC-10-20 installation, and we have active study—joint study efforts underway on all of the older airplanes, and some of the work that we have done has contributed to some of the estimates and things that were shown earlier this morning.

Dr. JOHNSON. Do you foresee any step function improvement in any way that the future holds in noise reduction?

Mr. KESTER. There is always the hope that someone will come out of the laboratory yelling "Eureka, I have it." After being in this business for close to 15 years, I have given up hope of that happening. When you talk about a step function, I think the biggest step function in noise improvement that I have seen and that I probably expect to see in the near future has been the JT9D-type powerplant, which is now typical of the powerplants, the General Electric CF-6 powerplant in the DC-10 and the powerplant plant for the L-1011 airplane, where you have gone to the high bypass ratio which significantly reduces the jet rumble, and where we have been able to go to a single stage fan without the weight chopping phenomena and reduce the fan noise, and where the installation has a liberal amount of acoustical treatment.

So I think the breakthrough has happened. I just wish more people would realize it.

Dr. JOHNSON. Thank you.

Dr. MEYER. Mr. Eldred?

Mr. ELDRED. How much increase in level of effort, or R. & D. level of effort, do you think it would take on a national basis to really realize the maximum out of this breakthrough, get rid of the combination zones so one could get down to the jet noise threshold that you can have with the high bypass ratio engine?

Mr. KESTER. The type of program you talked about here is one of continuing to add more and more acoustic treatment to the installation to further suppress the fan noise.

Now, the takeoff of the 747 you heard in the movie was one of the earlier airplanes. We have had a continual program to reduce the noise of subsequent airplanes and I believe that you will find that the airplanes produced after December 1971 will have audibly improved levels of noise over the first airplanes.

Mr. ELDRED. I wasn't addressing it to the JT8D or any specific existing engine, I was addressing the question to developing the technology for the next generation high bypass ratio engine.

Mr. KESTER. It is a very difficult question to answer because you are asking me how much does it cost to make an invention, I believe. We can continue to exploit the type of thing that we have done to the JT9D, and such things as increasing the bypass ratio, slowing down the fan speed, adding more treatment. These are not breakthroughs, these are just exploitations of what we now know. However you exploit them depends on how severe the economic penalties become as you go further, and also, of what significance are the noise reductions. Are they real or are they cosmetic? I really don't think I know how to answer the question of how much money does it cost to make a breakthrough.

Dr. MEYER. Mr. Berland, do you have a question?

Mr. BERLAND. Yes.

From what I understand, the development of the JT9D and whatever the next designation of the engine that follows, essentially are refinements of existing design in a large amount, so that you get more power and hopefully a little less noise. But as the jet engine was a tremendous improvement over the piston propeller method of propulsion, is there now on the boards or is there now in your thinking another generation, another kind of propulsion that could provide the thrust and no noise or essentially no noise? Is that an area being worked on?

Mr. KESTER. Any aircraft powerplant, to produce thrust, has to take on board air and expel it at a higher velocity. Force is equal to mass times acceleration and that is how you get thrust, by taking on board air and blowing it out the nozzels at an increased velocity. All aircraft propulsion systems do this. And the amount of horsepower that you have tied up in a jet engine is something that is rather fantastic by most people's recognition. The horsepower developed in the turbine of one of these JT9D engines would drive several large ocean-going oil tankers. There is a tremendous amount of horsepower that you are putting

into that air to drive the airplane. I really don't know of any alternate propulsion method that might be forthcoming at all in the near future. We have looked at engine designs that take in more air and expel it at lower velocities, and these are practical up to a little bit further than we have gone, but I don't see any new propulsion system on the horizon.

Mr. BERLAND. Thank you.

Dr. MEYER. I will remind the panel that if they have any additional questions, they should give them to me so I can incorporate them with mine, which I will send on to the witness and ask that he respond to them in about 2 weeks. We will hold the record open for approximately a month. So you have some insight into the sort of questions the Chairman will ask, let me say that they will regard percentage of investment which was Government supported, percentage of investment which was in-house Pratt & Whitney. We will not necessarily need to get in the company's secrets or anything of that sort, but certainly percentages can be provided—that which also came from the airframe manufacturer and things along this line, getting into the real economics of this.

We are interested in this because of the substantial capital investment which the film showed your company has in this area, and I think it is rather important that we have that kind of information for the record, because it is a very significant investment; one can see that just from the hardware that you have depicted.

Mr. KESTER. Thank you.

Dr. MEYER. Thank you very much. I would appreciate your cooperation on that.

At this point I would like to ask Mr. Franklin Kolk, vice president of American Airlines, a significant aircraft operator and major industrial representative of this important industry. Mr. Kolk, nice to see you again, sir. I appreciate your being here.

STATEMENT OF FRANKLIN KOLK, AMERICAN AIRLINES

Mr. KOLK. Thank you, Colonel Meyer.

This is an amplification of my statement in Chicago.

Mr. Chairman and members of the panel, I appreciate this opportunity to update and supplement the statement I made to your hearing in Chicago on July 28, 1971.

You will recall that my previous testimony cited to DC-10 as a prime example of how noise reduction to the existing state of the art had been required by the airlines of aircraft and engine makers, and had resulted in a new jet that is 15 decibels quieter than the long-range Boeing 707, Douglas DC-8 jets.

I stated that Federal preemption in the field is required to set noise rules correlating design certification and flight operation factors. I expressed a view that rule setting and enforcement properly belong with the FAA—that is the agency responsible for the flight safety and airworthiness standards—after due consultation with the Federal Environmental Protection Agency.

I urged that the Government inhibit noncompatible uses of property adjoining airports and since local zoning jurisdictions often overlap and conflict, I suggested that Federal model ordinances are needed for local consideration and implementation.

I also pointed out that since steeper flight paths reduce noise for both takeoff and especially approach, NASA and American Airlines had underway an identical program to explore what instrumentation and flight techniques might be required to safely utilize steeper approaches.

I am pleased to be able to report that this program has now been completed. It has demonstrated to us that the two-segment approach technique may help us bring relief to noise sensitive areas.

Our program involved the use of a 720-B aircraft with JT3D engines. An available area navigation system was installed and coupled to the flight director with some special switching circuitry. The system allowed flight down an initial slope of 6° , intercepting the normal $2\frac{1}{2}^\circ$ to 3° glide slope at a selectable point fairly close to the runway threshold. The entire maneuver was under flight director command, especially the intercept of the final glide slope.

About 25 pilots were thus able to fly the airplane safely. Admittedly they did this under very ideal conditions. The airplane was flown on instruments but not under conditions requiring instrument usage. It was not flown in the presence of adverse weather conditions, such as strong winds and wind shears. Only Stockton Airport was used. But the work did produce very considerable noise reductions in the approach phase and leads us to conclude that an expanded program of exploratory work should be undertaken to establish feasibility on other types of aircraft on real live noise sensitive airports, and under real weather conditions, and with a greatly expanded base of pilots.

We hope that funding will soon be available to permit us to follow up this very significant development.

In my earlier testimony I stated:

Most State and local responses to the Federal Aviation Administration's advance notice of proposed rulemaking on aircraft noise retrofit insist that the noise retrofit be required. These responses have cited publicly available literature to prove technical feasibility and economic reasonableness of retrofit. Yet the tests demonstrating technically achievable reductions relate almost entirely to approach noise only, dominated by high frequency fan noise, and applies only to certain 4-engine aircraft which account for less than a third of the free world's airline fleet.

I went on to say:

No noise reducing retrofit kits of any description whatsoever can be bought today. The fact remains that the noise reductions which would be derived from a balanced noise retrofit program would occur gradually over a period of about 3 years, starting 2 years from time of go-ahead. By then, 1976 at the earliest, many of the aircraft would be retired or scheduled for retirement.

These statements are no less true today. No overall retrofit program can be defined without taking into account that each airplane type must be treated separately, as a distinct project, because of the physical differences between aircraft and their engines. As far as I can determine, each publicized retrofit cost estimate has been arrived at differently. I see little or no evidence that any cost estimate put forward to date has been based on either a specific set of hardware or a prescribed program

for its installation. Cost quotations that have been bandied about rofit kits. They do not take into account that the hardware cost apparently refer only to the cost of manufacturing noise ret-represents only a downpayment on the entire noise retrofit package.

What are some of the other costs? First, consider an aircraft which requires extensive replacement of large pieces of equipment, such as engine mounts, cowlings, reversers, et cetera. All of these components have a book value which varies to the date of purchase of the aircraft, according to the date of purchase of the aircraft. Some of these aircraft are now quite old; others are only recently delivered. Under a retrofit program such equipment would become instantly obsolete and have no resale value. It would have to be written off.

It is also expensive to maintain adequate inventories of essential spare kits and components. These costs must be added in.

When an aircraft is taken out of service for installation of noise retrofit equipment, it is nonproductive and cannot earn its keep. This factor must be taken into account.

Interest must be paid on the long term capital required to finance the retrofitting. This applies no matter who pays for the noise retrofitting. No one has asked or even suggested that the Government should defray the cost of noise retrofitting. The closest thing to a Government subsidy program lies in proposals for a retrofit loan guarantee fund created by a special passenger surcharge on airline tickets. This sounds reasonable enough until you remember that the surcharge only helps set up the loan guarantee fund. It is still up to the airlines and its passengers to pay off the loan principal with interest. This is tantamount to double taxation of the airlines' passengers.

None of the proposals I have seen now, up to now, mention the outlays required to recertify retrofitted airplanes for duty. Recertification expenses, which vary somewhat according to the size of the airplane, might range from \$15 million to \$50 million. The only way to get a cheaper recertification is to do a very conservative type of recertification and this only degrades further the available performance and safety of the airplane. Frankly, I do not know what these costs might total in the aggregate, but they seem certain to exceed the estimates that have been blithely thrown about at hearings such as this one and in press releases.

Clearly, there should be no Federal requirement for noise retrofits until the total economic cost of the proposal is duly ascertained and until reasonable means are readily available for defraying these costs.

In conclusion, I would stress, as I did in July, that the most pressing basic research need both in terms of understanding today's problems and guiding future research is in the area of human response to aircraft noise. Until a more complete understanding is achieved of what type of community noise is acceptable, judgments as to where the noise research funding should be expended will at best be speculative.

Pure tone spectral shapes and absolute level and rate of exposure need to be understood in terms of their individual and combined effects on human responses.

The effects of low and high frequencies, pure tones—I think I have a bad copy here—this research is needed to support current studies on the potential benefits of noise retrofits to provide direction for the advanced research projects, to provide guidance for the design of future conventional, high speed, and STOL aircraft and propulsion systems, and to determine the environmental impact of the air transportation system as a whole.

Current procedures such as the noise exposure forecasts are inadequate in their present form to provide the answers and guidance required. In addition, research must take into account not only the social aspects of noise annoyance but the medical ones as well.

While we can calculate the amount of noise reduction in decibels, we still have no solid foundation which says how much meaningful relief will be derived per decibel. We know that if we could render aircraft inaudible complete benefit would accrue. But this is clearly beyond our practical grasp.

That is where technology leaves us. Hence research is incomplete and vitally needed. Facilities to complete this research exist but funds are insufficient to proceed with their use except at a snail's pace.

Until this information is available to responsible agencies, it will be impossible to evaluate the available options intelligently and to allocate available resources responsibly.

My company has already contributed in a monetary sense. We have estimated that we have spent in the last 10 years 43 percent of our net profit in capital for expenses related to environmental improvement. We are prepared to do our part to the prudent limit of our capability.

Thank you again for this opportunity to reappear.

If you have any questions I will be very glad to answer them for you.

Dr. MEYER. Thank you very much, Mr. Kolk.

Again, because of the pressures of time, I am going to ask the panel to make their questions brief, and ask you if you would agree to respond to some of them in writing later, if you would be so kind. The Environmental Protection Agency agrees with you regarding the urgency of the need for research on human noise problems, better criteria for a definition, not only aircraft noise, but all forms of noise, particularly transportation noise.

If Congress in its wisdom gives us the authority through the legislation now being considered by them, then we can assure you this is going to receive the very highest priority. We hope your airline and also the Air Transport Association will work with us at that time to move in a joint effort to come back to what we were talking about earlier, how to design the engine. That depends a lot on what is the criteria on the ground. I am glad you highlighted that in your testimony.

You have spelled out that we need to know a lot about things that we do not now know, a problem of economics, and all these various costs that you have cited. And it is obvious that we need to know more about where to put our priorities.

I know that you are familiar with current institutional arrangements with the aircraft, particularly the interagency aircraft noise program, other similar arrangements.

Do you have any thoughts as to what can be done to improve the way in which we deal with the problem and how we can best order our priorities?

Mr. KOLK. That is a very difficult question to answer.

Dr. MEYER. I realize that.

Mr. KOLK. It is very, very true that most of us—in fact, you know, just a very small community of people have the capability of dealing with this problem intelligently. We have been trying together for a number of years to do just what you suggest; that is, to order our priorities, and to get at the nub of the question.

As we get better perspective on our technical and social problems, the things we need to do perhaps change in order of priority. And it has been very difficult to start various programs up in good faith and then find out that we might be galloping down somewhat the wrong road.

This has happened repeatedly in this business as we have learned more and more about it. And I do believe that there are things that can be done today. For instance, we are now becoming aware of the fact that the attitude of the receivers of the noise has a great deal to do with their response to the noise.

In fact, there is a lot of evidence that indicates that the response of a group of people with a given set of attitudes to various levels of noise exposure is sure that it would take a very, very large change in noise exposure to change—to significantly eliminate their reaction. Yet, we know that, or we have a glimmering of the fact that differences in reaction between definable groups of people in terms of their attitudes is far more powerful than anything that we can do physically in this noise exposure.

Clearly, if we take the information that we have today and attempt to apply it in a development of a system where we are trying to make mutual compromises for total overall optimization, and with the technology that we have available today, if we simply rely on lowering noise exposure, the evidence is that we will not accomplish our ends. It can only be accomplished by a combination of changing the exposure and changing the attitudes of the receivers.

Maybe I am not stating it really right, because I do not think you change the attitude of someone who is in an adversary condition by making a specific act. But there needs to be a cohesiveness, and a recognition that all these things will work together. For instance, there is a lot of evidence that a lot of the problems with noise around airports is actually caused by people who are afraid of airplanes crashing on them. And there is also a lot of evidence that a similar situation accrues with people who feel that the system of airports and airlines is guilty

of what you might say, malfeasance. And if the noise is lowered and these attitudes of fear and fear of malfeasance will remain, the problem will remain, and we know the problem will remain within the limits of our ability to create machinery that lowers the noise level.

We have a 15-decibel change in the current round of airplanes, which is really the accumulated technology of the past 10 to 15 years being plowed into certain newly developed types.

But if the introduction of these airplanes is not accomplished by a recognition that they are safe and that people on our side of the house are not trying, we are right back where we started and we have not bought a darn thing for our efforts.

Dr. MEYER. Thank you very much. Mr. Berland?

Mr. BERLAND. One question; all right? I have a dozen here.

Dr. MEYER. Well, I hope you will put them in writing, sir, and give them to him so he will have them for you and for the record.

Mr. BERLAND. OK. I will give you a fast, objective reaction, and I do not know if it is for American Airlines—and I am not afraid of flying, but when an airliner, jet liner or a freighter comes over my house at 11:20 a.m.—I am not that close to the airport in Chicago—I am irritated. I am similarly irritated specifically when I see an ad on television for American Airlines, a DC-10, a gal in one and a man in the other talk in front of a nacelle and talk about a quiet engine, it makes me wonder whether in fact, and this is my question, American Airlines went to the manufacturer and said, among the specifications for this airplane we want a maximum noise ceiling that is below and beyond that required by the Federal Government.

Did you in fact do so?

Mr. KOLK. We did in fact do so and I was the personal director of that activity. The airplane was conceived, or the idea of an airplane was conceived in 1966, January of 1966, to be specific. And the airplane conception was based upon the idea that we had to exploit close-in airports for the good of future transportation, and the specific airport we felt was the key to it was LaGuardia Airport in New York City.

LaGuardia Airport is a very noise-sensitive airport, and it is a very peculiarly placed airport relative to high volumes of people.

The Port of New York Authority has specific noise limitations set for overpasses at monitors, and we were quite well aware of their limitations. Their limitations, incidentally, have never changed. It is 112 PNdb up over the pole. But we clearly understood in 1966 that if that kind of an airplane, that very large airplane was going to be successfully operated on a piece of real estate like LaGuardia, it had to have the very best noise characteristics that could be obtained in an airplane.

And we wrote a specification for the noise performance of the airplane which in our view was the best that we could hope to get knowing what we did at that point about the creation of noise by airplanes. And it was considerably lower than any of the existing airplanes that flew into the field.

And I might add that the engine installation—well, the engine itself, which was finally selected by GE, but the other two engines, and they were a group, were built according to these

principles. The installation of the engine in the DC-10 was arrived at on a cooperative basis between General Electric, Douglas Co., and American Airlines, and United Air Lines as the initial purchasers of the airplane, with the idea of integrating noise control in the nacelle at the time of its design to the greatest possible extent. And the Douglas Co., and General Electric Co., who produced a nacelle, all cooperated magnificently in this endeavor.

And I will not say that if we did not start it off again today in 1971 we might not squeeze another couple of decibels out of it. But I can assure you that it first off met its objectives, numerical objectives, as best we could define it, and it is the first airplane that I know of that has been delivered to us on nominals in noise performance instead of just barely within the tolerances in some cases.

And I think they all did a magnificent job. I am very, very proud of it.

Mr. BERLAND. Can I see what the numbers were?

Mr. KOLK. I do not recall what the numbers were, offhand. I could furnish them for the record. But the airplane did in fact become licensed under the FAR-36 for three-engine airplanes, which I might add are more stringent than they are for four-engine airplanes. And it is the first airplane to my knowledge that has got an untraded certificate. In other words, all three points were below the requirement. And there was no requirement for trading and getting a license.

Now, I believe those numbers—I am somewhat more familiar with them. On takeoff, I think the airplane made about 99 EPNdB, and it is around 96 EPNdB on the sideline. That is 106 EPNdB on approach. Now, the normal operation of the airplane in and out of a place like LaGuardia will be at a very considerably lower level than that, because these are the highest levels allowed, at highest gross weight.

Dr. MEYER. Mr. Eldred?

Mr. ELDRED. Just one short question. What do you think it is going to take and how long, to see if one of these two segment approaches can be actually brought from this stage of research in to practice, sir?

Mr. KOLK. What we have demonstrated is the ability for pilots to fly this kind of a maneuver. And we did it at Stockton Airport, in good weather. We need to find out whether our assumption that the area of navigation system, which is a VORDME based system, will actually function at the noise-sensitive runways such as 22 at Kennedy, or the normal approach from the east at Los Angeles with the exact arrangement or location of the VORDME station, or whether there is any local aberrations that would do this.

We have to be sure we can do this on instruments so we are not talking about an instrument versus a VFR procedure, and this requires actually going out and doing it under those conditions.

We are quite concerned with what happens if you do it with wind sheer, particularly, because of the steep segment—that was done at quite a low thrust level, and if the airplane encounters

conditions that will require lower thrust than we were using, we might get into a spinup problem, spooling-up problem, on the engines. And we have to get a far broader base of pilot opinion because after all, it is the pilots who must in fact perform this maneuver, and while some of the pilots were quite enthusiastic, some of the pilots were also rather neutral to it, and the only thing we can say for the present sample is that nobody really said that they couldn't do it if they had to.

These are the kinds of things that are going to take an awful lot of program operation of an airplane. And I would feel that what is required is a program of taking an airplane of the type we had and operating it for somewhere in the order of 6 months around the country at various places like that, widening the sample. And this is going to require, I think, in the end—I think the program will cost something like a million and a half dollars to support the operation of this airplane.

When you start talking about money, identifiable sums of money that big, everybody jumps into the bushes and hides.

Dr. MEYER. Mr. Kolk, could I ask a question, an extension of that question? Is there any plan for this that you know of?

Mr. KOLK. I am attempting to formulate a plan for this now. And I am seeking public assistance through NASA and the FAA to support this program because it is well beyond the capabilities of my company to do this as a present to the industry.

Dr. MEYER. Could you keep us informed about whatever way that Mr. Ruckelshaus and the Environmental Protection Agency can lend you support, because we have no funding authorization for this effort at this time, but we would have under the new legislation. But there are some things we may be able to do working with you, and I think it is of such significance to the total effort that we would like to be brought into play with you on this, if we might.

Mr. KOLK. Very good.

Dr. JOHNSON. I do not have a question, and therefore I do not expect a response. I wish to make a comment in order to provide some balance for the rationale presented. Namely, sure, we all recognize that the thing we are trying to appease is subjective in nature and, as such, it is impossible to assure that you are putting a proper dollar value on anything. As a consequence, no one will ever know for sure whether you are making a wide dollar investment. Therefore we must decide whether we are going to follow a policy of trying to make improvements or whether we are not.

I believe that we will all agree that we do want to make improvements, even if this requires retrofits. And from time to time, definite decisions are made such as allowable noise levels, and these are made with these things in mind. And, therefore, we cannot afford to wait until we are sure everyone is going to be satisfied before we require a new improvement because this will never happen.

Mr. WISE. Mr. Kolk, I am unqualified to speak to the technical aspects of today's discussion, but I think I am qualified to speak to Mr. Berland's comment, and I disagree with it. If I had seen this commercial that showed that your airline was quieter and put

out less vapor and improved the atmosphere, so forth, I would have said bully for you and I would have come up on your airlines instead of Braniff from Dallas. And to me, that could be the real incentive for the various airlines in the good old spirit of American free enterprise and competition, to push your technicians and say get us a quieter engine so that we can get in there before Braniff does, or Continental, or whoever, and say, "We got a quieter, cleaner, better airplane that gets you there faster," sort of the same thing we talked about rapid transit yesterday.

I would think that would be—it wouldn't show up on your annual report or financial statement, but it would certainly manifest itself in more customers, and I think it would be the real incentive which should push vice presidents of American Airlines and the other airlines like yourself to say "Get us this before the competition does, and advertise it very widely indeed."

Mr. BERLAND. Mayor Wise, we don't disagree at all.

Mr. WISE. I thought you said you resented the advertisement.

Dr. MEYER. I think we all do agree but there are some good differences of opinion on this panel, and I am glad we have some strong personalities here.

Mr. WISE. I would ask you if you have consulted with your public relations department on that, because as I say, it wouldn't show up on your financial statement, but it could sure help your customers.

Mr. MARTIN. That is a mighty courageous statement for the mayor of Dallas. Just one quickie, and that is, with the two-segment approach, how many nautical miles that are now heavily exposed in the noise impact area, basically, would you move in to a closer area, or eliminate?

Mr. KOLE. That question doesn't have a hard answer. We were making our intercepts between the 6° and the 3° at an altitude of about 400 feet in this work. And this was something slightly over a nautical mile from the threshold. We were getting substantial noise benefits back—starting back perhaps a mile and a half, and I might say that the noise benefits that apparently have been measured—although the report is not yet in, has not yet been drawn up—is such that they are of the order of magnitude of the noise benefits of the most optimistic of the retrofits. But to implement a system like that, you would not start in by making this intercept at 400 feet, you would probably back off to the order of 800 feet, and double the distance out at which there would be a gain, and you would operate that way until you were darned sure that the pilots knew how to go around this bend. And then as they demonstrated proficiency you would start to move the intercept in closer to the runway. But this is one of these areas where there is a genuine, sincere safety regard, because the consequences of missing the glide slope coming down from above at an altitude of 400 feet are not the kinds of things that we want to talk about.

Dr. MEYER. Dr. Bolt?

Dr. BOLT. Yes. Two of the things that you talked about, one earlier mentioned and one later, seemed unrelated and yet I am just beginning to wonder if perhaps there is a relationship be-

tween them. Let me define them both briefly and then ask you if you see a possible relationship.

The second one of course was your interesting comment about attitude. How a person perceives the situation really determines what he does about it.

In this connection, you mentioned that we are beginning to learn some new things about human behavior and one of the interesting things was mentioned after the testimony in Boston a few weeks ago, in an EPA hearing, on some results of experimental research in clinical psychology showing that if a person exposed to noise has some control over the situation, even though he didn't use it, there was a beneficial result shown in his performance.

Now, in a rather similar vein, as you have mentioned, if a person believes that what is being done about it is the very best that can be done, this has an influence on his attitude. He believes there is no maleficence and quite the contrary, that what is being done to control a difficult problem here, as he perceives it, has been done in his best interests. That is one factor.

The other item was your reference to your testimony in an earlier hearing about the recommendation that FAA should have the prime responsibility for standard setting in this area. FAA, as I understand it, has a basic responsibility to the public to promote aviation and a basic responsibility to the aviation industry to develop this as a means of transportation. What was going through my mind is the possibility that an agency that did not have that kind of responsibility, an agency that was perceived by the public as being truly in the public's interest, or were responsible for the primary standard setting, whether this might not beneficially affect the attitudes of the public, making them perceive the situation as one that has been controlled in their best interests. And I am not really talking about the physical facts of the situation, I am talking about the perceptions as related to the institutional arrangement.

Mr. KOLK. I think that is an interesting point. I think it is one of these things that you add up with the things on the other side of the house, that perhaps the greatest gains to be made are not the technical gains at all in terms of the generation of noise but the control of the aircraft. And this is clearly in the FAA's bailiwick. I think the real problem is to have dedicated people trying to solve this problem, and if I may—I know I am taking a tremendous risk on saying something like this out loud, but we need help from the public opinion leaders in dealing with the public.

If we are doing the best we can as an airline, as an aviation community, and the local mayor of the noise impacted area—and I say mayor not because you are up there, sir, but there are a lot of them that have taken this attitude, have run for office on the basis of "Let's make these bastards do something"—this isn't—

Mr. WISE. I agree with you wholeheartedly.

Mr. KOLK. This isn't helping our attitudes along. We need a cohesiveness here. We need a togetherness, we need a cooperation that is totally lacking in the present situation. And I think

that if you achieve that it probably doesn't make any difference who does the regulating, and if you don't achieve it, it doesn't make any difference anyway because everybody is going to be so damn mad at everybody else that they are going to be totally annoyed.

Dr. BOLT. Well, clearly, without cooperation and mutual goodwill we are not going to make progress. Clearly of course the FAA has the general area of responsibility for operations and especially for safety, and in my book, safety precedes noise. But now as we have been talking back and forth, I am beginning to recall conversations I have had with individual citizens in surveying and interviewing in this area, where people make statements that—this sounds very naive to me when they make them, about the fact, "How can I trust that particular setting of standard, after all it was done by that agency down there that was pushing the airline." And I really wonder if there might not be something in it. I think developing true cooperation between the industry and the agency responsible for aviation as such and the other agencies such as EPA that might be given the primary standard setting on behalf of the public could be developed regardless of which way this thing went. What I am really thinking is that out there sit 200 million people. Some fraction, maybe a very small fraction, really make their decisions in terms of how they perceive whether that agency is really working in my behalf or should I still keep trying to fight it, and maybe it is one of those situations where we could win by maybe going the other way a bit.

Mr. KOLK. I think—

Dr. BOLT. It is worth thinking about perhaps.

Mr. KOLK. I think there is a lot in what you say, Dr. Bolt. I think my main reaction is, I am terrified of someone who says, "Don't bother me with your problems, just fix this problem," so and so. The only way I can do it is just put the airplanes on the ground. This is the real danger of having an outside agency do it and I think my industry's position is very, very tempered by this attitude.

Dr. BOLT. Of course in the case of radiation I think this separation of responsibility for the standard is being made now, the atomic energy relationships. There is one example of public action taken in the other direction.

Also, unless I am just being hopelessly optimistic here, I read into the very vigorous set of hearings that EPA has been carrying on around the country the kind of forthright and comprehensive approach to the problem that would lead me to believe that if they were given this responsibility they would do it in a very rational and intelligent manner with full cooperation from the aviation industry.

Dr. MEYER. I am going to have to close this off at this point, because of the time constraints. And for some obvious reasons, I am not going to inject myself into this dialog between the panelists and the witness, except I would point out one thing. Mr. Kolk. Having been associated with aviation for most of my professional career, although in the health and safety side of it, I am as equally concerned as an individual as you are about safety

of flight. I would point out that one of the panelists who I am not going to identify is a former Air Force pilot, and is jet-rated, and has directed a question or two which could be taken as being somewhat pointed. So we are sensitive to this problem. The only philosophical view I could put in is that you can argue which folks ought to be watching which chicken pretty emphatically and you can sometimes say, well, one agency can do a job better than another one. I think the Congress in its wisdom, whether the system works well or not, did indeed see fit to separate the food inspection business and the drug inspection business away from the Department of Agriculture. When FDA is doing the job as well as some people think it ought to, the people who raise the animals and who grow the crops are not the ones who do the setting of the standards of the inspection of the food products. Yet on the other hand, although there have been some changes lately, one cannot deny the fact that within the atomic energy industry, one of the best safety and health records of any industry in the history of man was set by internal regulations for quite a number of years. It wasn't until it got outside of the limits of the AEC plants which were under their control and began to be a public problem that the system began to break down.

So, looking at it from every side as a responsible public administrator, I would have to agree that there are many ways of solving these problems, as Dr. Bolt has pointed out. All the philosophy, all the theory, breaks down completely when that intangible thing known as public attitudes has to be recognized and accepted as being the determining factor. I think that what we have really got to take a look at is, working together, how do we achieve the end, using the same resources? And I think you would agree that we need to get together, all of us, all the agencies of the government, all the industry, on this problem. Because it is certainly a major problem.

Thank you.

Mr. KOLK. I have several copies of my statement, if you would like to have them.

Dr. MEYER. Yes, sir. That is a very excellent statement and we look forward to working with you. As I indicated before, let me know what you would like us to do to provide support for proposal of further investigation and evaluation of this new method of approach. We certainly will help, because the evidence that we have accumulated in the last series of hearings indicates a deep public concern over this problem.

Mr. KOLK. We will keep in touch.

Dr. MEYER. Thank you so much.

At this point, continuing with our series devoted to the aircraft industry, I would like to ask Mr. Bricken, Gordon Bricken of Northrop Aircraft Co., if he could come up.

STATEMENT OF GORDON BRICKEN, NORTHROP CORP.

Mr. BRICKEN. Dr. Meyer, members of the panel, my name is Gordon Bricken, senior engineer, Noise Applications Products, Northrop Corp. I come before you to this hearing representing the Environmental Systems Department of the Northrop Electro-

Mechanical Division. The Northrop Corp. is a diversified high technology corporation which has recently developed applications for its advanced technology outside the aerospace industry. The environmental systems organization is Northrop's outlet for technology, services and products designed to bring about constructive solutions to environmental problems.

One of the problems we are concerned with is noise. All of you are aware of the problem of noise. Within the communities of this country the most dominant type of noise is that produced by industry and transportation. Perhaps the most significant contribution to transportation noise is the jet aircraft. It is to this source and to the management of its noise that we are concerned in our testimony.

The ear-splitting sound of the jet aircraft is a partner in every airport in the country. In the past 10 years many organizations have examined aircraft noise and carefully thought out long-range solutions. For the most part, though, little has been done to systematically apply known technology to control the presently controllable aspects of jet aircraft, namely, operations.

It is a fact that control of flight paths, power scheduling, flight schedules, and persistent noisy aircraft can bring about a decrease in airport community noise exposure.

Such management of noise is possible through the use of modern data acquisition and data processing techniques. No longer is it desirable or is it necessary to rely on the uncertainty and the limitations of the man with a meter.

In California, at the Orange County Airport near Santa Ana, there is in operation an areawide noise monitoring system that operates 24 hours a day. This system, known as Ecolog I, serves as the tool for the airport to administer its program of managing of aircraft noise.

As presently installed, the system consists of five sensors, three of which are located on the normal departure zone of the airport in a triangular array and two of which are located on the normal approach zone to the airport along the ILS radial.

This layout is used for evaluation of conformance to noise abatement procedures, determination of violation levels, and assessment of community noise exposures as prescribed in the new Noise Regulation for California Airports.

The system consists of field stations with microphone and electronics that convert sound levels to a form compatible with transmission over standard voice grade telephone lines to a central location.

At this central location is a processor consisting of an input-output buffer and computer for arranging and manipulating the data for output to two display devices. The output peripheral devices consist of a teletype providing real time data in a convenient format and a visual display for convenient readout.

The computer program provides a multiplicity of easily adjusted variables to assist the user in interpreting and extracting needed information. All of these pieces are tied together to form a complete areawide system.

And in this particular slide, you can get an idea of the location of the sensors.

A little closer inspection of the printout shows the airport obtains single event readings for every aircraft departing and arriving at the airport in the California index, single event violations of preset violation limits, automatic hourly energy averages and daily energy averages in the new California indexes.

Also obtainable are automatic or manually selected historical records of fly-over events either singly or in groups. By looking at the noise levels difference between stations and characteristics of the histograms, the airport is able to construct an accurate picture of aircraft activities from the noise point of view.

The noise monitoring system is an integral part of an airport noise management program and it offers several significant advantages. Continual surveillance and analysis of computer-produced records allow the airport to obtain accurate statistical records of noise levels and changes in those levels.

Real time operation allows the airport to respond immediately to community complaints and the airport to immediately signal offending aircraft of their violation condition.

Such flexibility allows the airport to bring the community into closer understanding of the airport's operations and to develop meaningful dialogue for the improvement of airport and community relationships.

A portable feature of the system gives the airport the advantage of assessing the noise conditions created by special aircraft problems or other sources in the surrounding area.

The wide range of capability obtained by the system creates varying manpower requirements for its operation. The airport operator can rely simply on the data periodically removed from the system and packaged for analysis by other groups, or he may wish to establish a more mature management program with a full-time noise abatement specialist.

This man not only operates the system but stands in for the airport manager in the bettering of community relations program.

For the most part, the system operated unattended requiring only periodic replacement of consumable items. Corrective maintenance when needed is performed by modern plug-in methods, thereby minimizing the skill level to keep the system on the air.

If we recognize that noise is a problem because of the community, the payoff that comes from use of this tool in a proper fashion is better community relations. As an example—and that fact was alluded to in previous testimony—a noise management program may actually reduce the noise levels by five or six decibels. However, the fact that you have a program and you have continually made the community aware of its progress makes the aircraft sound levels less "unwanted" creating as much as an effective 10-decibels decrease in noise levels around the airport.

The technological feasibility and the benefits must, of course, be weighed against the economic investment of such equipment. Small systems of five stations can be acquired for \$30,000 to \$50,000. Larger systems can run as high as \$200,000. Operational costs vary from location to location but will run several

hundred dollars a month for telephone, electricity, manpower, and insurance costs.

By way of comparison, the standard technique today for alleviation of the problem—readily, and not so readily, in some cases—is to buy homes near the airport at \$20,000 to \$30,000 per home. The expected saving of from three to five homes in such an acquisition program, by use of a monitoring program, makes the equipment well worth its investment.

Why, you may ask, if monitoring techniques are useful and beneficial in helping a community, are there no more than three systems in operation in the United States?

The answers are particularly significant to you today. Three problems stand in the way of wider use of monitoring technology:

First, the almost total lack of simple and convenient standards for measurement make it difficult to develop equipment for wide-scale application. While the Ecolog System, for example, with its computer flexibility alleviates much of this problem, it is still difficult for the airport operator or people responsible for setting standards to know what criteria to specify that will be applicable not just today but for some time to come. Since he rarely is competent in this matters, he rightfully chooses to avoid making any decision at all.

I would add as a digression from the written testimony I have before me that another problem with the standard situation is that so many of the standards that are being proposed or being considered are simply incomprehensible to the average person, and this is one of the problems that also stands in the way of getting wider acceptance of monitoring techniques.

Second, there is no clear-cut jurisdictional authority for noise control at airports. The airport operation is told he has no jurisdiction of aircraft in flight. The FAA says it has no jurisdiction over the aircraft on the ground. Yet the airport operator is confronted with the possibility of interference with interstate commerce if he considers regulating the numbers of flights or times of operation or use of noise regulations.

Finally, there is no real mechanism for bringing citations against violators of local noise ordinances drawn in spite of the specter of Federal preemption. It appears clear, then, that while the technology is available as discussed today, and it can be applied in some cases at reasonable cost, wider benefit will only come about when there are more definitive assignment of responsibility, standardization of measurement indexes and constructive regulatory criteria.

We hope that this presentation today will in part serve to benefit the people of this country and your Agency in providing, at least in part, a meaningful methodology for striking a détente between modern jet airports and their surrounding communities, once again bringing them together.

Thank you.

Dr. MEYER. Mr. Bricken, I can assure you that this presentation is going to do just exactly that. I want to compliment you upon the "technical"—in quotes—quality of this very, very lucid and highly proficient presentation. You gave a lot of information

in a very short span of time. It is a very fine piece of work and you are to be complimented on it.

Again, with the interest of time we will hold down the questions to one apiece on the panel. There may be some others that we want to direct to you in writing.

I'll start of on the left. Dr. Martin?

Mr. MARTIN. No, sir.

Dr. MEYER. Mayor Wise?

Mr. WISE. No, thanks.

Dr. MEYER. Mr. Eldred?

Mr. EDLRED. No questions.

Dr. MEYER. Mr. Berland?

Mr. BERLAND. I just have a comment. I agree with your discussion of the problem, and we heard some of this yesterday, vis-a-vis the FAA and jurisdiction over local jurisdictions. I don't agree with your solution, to make the community more aware of this, ergo, the noise becomes less of a problem. I don't think aviation noise is a community problem. I think it is an aviation problem, and that is where the solution lies.

Dr. MEYER. I would share that view, Mr. Berland, and I would say, though, that using the approach outlined here, once one could solve the knotty problems, mentioned yesterday and highlighted towards the end of this presentation, about who has the responsibility, this could mean a very effective tool for enforcement. This is the thing which I am convinced one has to take a look at in terms of the problem of cutting through all this maze of interrelated responsibilities. We also need to determine how you really come up with a meaningful system that somebody is held accountable for in one way or another. And this seems to be a useful tool to me.

Mr. BRICKEN. Doctor, I might make this remark, that one of the problems, at least as we see it, is that while Mr. Berland's remarks are certainly very appropriate, and the solution in the long range will come, at least in part, from the aircraft industry, that a great deal of time and energy is spent in the communities of this Nation essentially arguing over just the fact, just what are the facts, and frequently you do not get to the point of discussing what are the ways we can solve them, but we have been arguing what is the problem? And even though you hear a great deal of comment about it we find that at least in the experience we have had, this removes one source of argument, and allows the community and the airport and the industry to proceed to the next stage, which is perhaps to bring about the longer range solutions.

Also I think that it tends to give the airport and the community a period of time where they can then constructively work on the long-range solutions. If you can't get to the problem of landings control and landings conversion and all the theory about it is not really worth anything, and that is one of the things that has happened here in the Orange County case, that they have now had the opportunity to get to the questions of land use conversion, land use control—and I might add a factor that is not widely discussed, although it is widely known, and it is very important—the conversion of the building codes in

the country to represent truly adequate protection, to where it is possible to give it.

I might also add to that even with building codes and land use control and all of the building codes in the world are not going to solve the problem if the aircraft are not where they should be in relation to those defined areas which are being controlled by those techniques.

Dr. MEYER. Yes. Fine. Thank you very much, sir.

I would now like to ask the representative of Cummins Engine Co., Mr. Wulfhorst if he would like to appear and speak this morning.

**STATEMENT OF DAVID WULFHORST,
CUMMINS ENGINE CO.**

Mr. WULFHORST. I think I will be kind to you, having sat all day today, and we will try to make this as briefly as we possibly can. I don't think it will take very long at all.

Dr. MEYER. All right, Mr. Wulfhorst, you have a prepared statement here, which, as you wish, will be included following your verbal statement. If you wish to summarize it all in any way you may, and this whole thing will be printed and used by us.*

Mr. WULFHORST. All right, fine, Mr. Chairman, members of the panel, and audience, my name is David E. Wulfhorst, I am director of environmental management for Cummins Engine Co. in Columbus, Ind. I have Mr. John Walter, who is our director of applications engineering, with me today.

Cummins is one of the leading worldwide manufacturers of high speed diesel engines used in the heavy duty trucking, construction, industrial, and marine industries. We are here today to present you with a technical report we have prepared on diesel powered system noise.

Cummins Engine Co. has for many years been taking active steps to control environmental degradation—the control of noise has been no exception. Some noise control programs at Cummins were begun as early as 1960 and by 1966 had developed into intensive, long-range studies of the sources of and means of controlling diesel engine noise, the attached report describes the noise reduction work done to date.

We feel that it is germane to make two major points at the outset of this testimony:

First, it is important from an effective cost-benefit standpoint, that vehicle noise reduction be attacked from a systems approach. Although we do not manufacture trucks or construction equipment, we make diesel engines which power a wide range of modern, heavy-duty equipment. The overall noise level of the equipment is a composite of many noise sources, the engine being one. Reducing the noise from any one source such as the engine will not necessarily result in a reduction in the overall vehicle noise level. The overall noise reduction is dependent upon the prominence of the noise source reduced.

*This material is on file at the Office of Noise Abatement and Control.

Second, we feel that Federal preemption is necessary for effective noise reduction. Agencies of the Federal Government should assess the nature and magnitude of the noise problem, and should establish and enforce nationwide consistent standards. A proliferation of State and city standards can only raise costs and increase confusion. While it may be necessary to establish more vigorous, or special use, regulations for some particularly troublesome locations, we feel these should be kept to a minimum.

As to the report, we have chosen to discuss diesel powered system noise by using a diesel powered truck as an example in both the attached report and in this summary. Similar approaches and arguments are applicable to other types of diesel powered equipment such as construction, marine and industrial applications.

The noise generated by a truck is a composite of at least four major noise sources—the exhaust, intake, fan, and the engine. However, as the overall vehicle noise level is reduced, additional noise sources become major contributors, for example, the major truck noise sources of a vehicle operating at an overall noise level of 88 dbA are those listed above—the exhaust, intake, fan and the engine. As the vehicle noise level is reduced to 86 dbA other noise sources such as the engine driven accessories—alternator, compressor, et cetera—transmission and the driveline also become major noise sources; this means that as the vehicle noise level is lowered the problem becomes much tougher and the systems concept becomes even more important for effective noise reduction.

Though Cummins does not manufacture vehicles or equipment, we do work in harmony with our customers to help them reduce vehicle noise particularly when the engine noise is predominant. In doing this we feel that we have developed a comprehensive testing program for determining the contribution of the various noise sources of a vehicle; it essentially consists of treating each of the major noise sources with lead backed foam or regular household fiberglass insulation until a "fully treated" vehicle noise level of at least 10 dbA below the desired vehicle noise level is achieved. Each of the noise sources—engine, exhaust, intake, et cetera—are uncovered individually and the contributing noise level of each source determined. By using this technique we are able to determine which are the major noise sources contributing to the overall vehicle noise. Once these are known, we can make recommendations to our customers as to what needs to be done to achieve the desired vehicle noise level. If the engine noise is predominant, we work with our customers to either isolate the engine noise or make changes to the vehicle installation to reduce the engine noise level sufficiently to achieve the desired vehicle noise level. This test procedure is described in more detail in the attached report.

As I have indicated earlier, Cummins has been actively working on engine noise reduction for approximately the last 12 years. Our work has shown that there are five basic means of reducing diesel engine noise. These include reducing—

- (1) The source of the noise.
- (2) The path of transmission.
- (3) The vibration of the structure.
- (4) The acoustical efficiency of sound-emitting surfaces.
- (5) Engine encapsulation.

Of these five areas, the ones which have resulted in the greatest short-term noise reductions are reducing the source of the noise and reducing the acoustical efficiency of the sound-emitting surfaces.

Reducing the vibration of the engine structure through innovative engine design may have long-term potential but it is very expensive since it would result in a complete redesign of the engine. Encapsulation would ultimately result in the greatest gains, but many problems in heat rejection and servicing have been encountered in its present stage of development.

To give you an idea of our success in some of these areas, turbo-charging, which is one means of reducing combustion generated noise, results in a 2-3 dbA reduction in some of our engine models when installed in a truck. We have also reduced engine-contributed vehicle noise by another 2-3 dbA by decreasing the acoustical efficiency of sound-emitting surfaces through the use of what we call isolated valve covers and side shields in some of our present production engine models. We have run encapsulation tests which have resulted in up to 20 dbA reduction in engine noise; total encapsulation is not practical at this point, however, since it would require a redesign of the vehicle.

The point I am trying to make is that we and others in our industry have been working on diesel engine noise reduction and have made some substantial gains. We expect to continue to lower diesel engine noise but are not sure as to the ultimate level we will achieve.

Though we have made gains in reducing diesel engine noise, these gains have not been made without increased costs. Cummins feels that it is extremely important to bring out the "cost of quiet" since the cost represents dollar outlays which must ultimately be made by society. There is no doubt, from cost standpoint, that noise must be reduced below the point where it is a health hazard. However, the cost of quiet should become a major consideration when setting welfare, or nuisance, standards as opposed to those clearly involving health. We have attempted to put together the best estimate of what the cost of quiet will be for engine noise reduction as we see it now.

The details of our estimate are included in the attached report, but the results show that the cost for reducing the contribution of diesel engine to the overall vehicle noise will not increase significantly until the 4-5 dbA reduction level is reached. At this point the costs begin to increase significantly. This data must be tied together with the data provided by the vehicle manufacturers to obtain estimates for the cost of quiet for the overall vehicles.

In summary, we would like to make the following points:

Cummins shares the concerns about pollution with EPA and society.

We have been working on diesel engine noise reduction for quite some time and have gained considerable expertise.

We believe that effective vehicle noise reduction must be achieved through a systems approach.

The cost-benefits approach should be a major consideration in setting welfare standards; and Cummins will work with its customers to try to achieve the noise levels that EPA feels best meet the needs of society.

Accordingly, we recommend that—

Simple, precise, and accurate procedures be developed for truck noise enforcement. The many precautions concerning wind velocity, measurement distance, road surface conditions, sound reflecting surfaces, and meter accuracy must be well defined.

EPA work jointly with the Society of Automotive Engineers (SAE) and the Engine Manufacturers Association (EMA) to apply their considerable expertise to the development of appropriate measurement and enforcement procedures.

A simple test method using simple equipment and techniques be devised to be used by dealers or repair shops for compliance testing. Again, we recommend that EPA, SAE, and EMA work jointly to develop appropriate procedures and, last, but not least, we strongly recommend that there should be Federal preemption of the noise laws of individual State and local governments so that limits may be consistently enforced nationwide.

We would be happy to try to answer any questions you might have.

Dr. MEYER. I am most intrigued by the cost of quiet comments that you have. And I was listening with one ear and looking with one eye. I flipped over to page 36 in your statement. Could you explain to me the estimated increased cost in consumer dollars—even in a projected rate of production?

Mr. WULFHORST. Yes, I would be happy to.

What we have done is try to put together some of the things we have done to lower engine noise. What we have done is taken the effectiveness of these treatments to the engine in vehicles, so we have the engine contribution to the vehicle, and then what we have done is try to figure out the costs, what it would cost both on an engine basis, some development costs, tooling costs, some increased service costs over the life of the vehicle, and we have tried to add these together, amortize those costs over the projected 5-year engine sales rates, and then we end up with this curve which ends up being an increased dollar cost per engine to the consumer.

Dr. MEYER. I don't want to take up too much time with this, but so the record will show that you have this chart, as I read it—you have a spread of values, and we will say an 8 dbA noise reduction is going to cost such and such for the total production, that is what I am trying to get at—the figures of \$1,000, \$2,000, \$3,000, \$4,000, that represents the total cost?

Mr. WULFHORST. Increased cost per engine, and the present cost of an engine runs somewhere in the range of \$12 to \$14 per horsepower. In other words, if you were to buy a 250 horsepower engine, say, for example, it would cost about \$3,000—if you wanted to reduce the cost by about 10 dbA you would have to

increase the cost of the engine about \$1,500, which would end up being something like \$5,000.

Dr. MEYER. That is what I wanted to get at.

Mr. WULFHORST. All right.

Dr. MEYER. With regard to the cooperation between EPA and segments of industry and institutions, one of the things I can assure you is that we do intend to do so at the time we get around to studying standards.

I will ask the panel, do you have any questions, one per each?

Mr. Berland?

Mr. BERLAND. I wonder if you could give us some perspective of comparison of noise generated by engines of equal horsepower, diesel versus gasoline powered? I know you are in the diesel business but I would like to have a perspective on it.

Mr. WALTER. Our experience, gasoline engine-wise, has been rather limited. We have primarily concerned ourselves with the diesel engine so I am afraid I can't give you a meaningful answer on that except diesel does tend to be a bit noisier.

Mr. BERLAND. That is my understanding. In terms of noise, I wonder which is the potential in terms of being able to quiet it.

Mr. WALTER. Gasoline of course would be better off, because they are starting lower, starting at a lower level.

Mr. BERLAND. Right.

Mr. MARTIN. Just a quick response. I think you have sort of answered part of this question in your report, page 34 or something. You have what would happen to overall vehicle noise by reduction in engine noise at various speeds, and basically, the quieting of the engine as you go up in speed tends to be very minor to the overall vehicle noise.

Mr. WULFHORST. Yes.

Dr. MEYER. Thank you very much, sir.

Mr. WULFHORST. Thank you.

Dr. MEYER. Particularly we are going to be interested in reading in detail your economic analysis which is a very important part of our studies.

Mr. WULFHORST. Should you have any more questions please feel free to contact us.

Dr. MEYER. We will send them to you. I am sure I want to be communicating with you further.

I would now like to ask Mr. Ringham to step forward. We are most appreciative of your appearing again for the International Harvester Co. You have contributed a great deal of time and effort to the field of noise control and have been very vigorous in providing EPA with a lot of valuable information. We are again pleased to have you with us, sir.

STATEMENT OF ROGER RINGHAM, INTERNATIONAL HARVESTER

Mr. RINGHAM. Thank you, Mr. Chairman. You really stole my first line. But while they are setting up for the slides I might begin, just in the interest of time, as you have already noted we have previously presented to the EPA panels information regarding construction equipment sound levels at Atlanta, truck

sound levels at Chicago, some recommendations regarding enforcement and data on enforcement site calibration possibility at San Francisco, and agricultural equipment sound levels at Denver.

The primary thrust of these presentations was to provide as concisely as possible for the sake of time, quantitative data relating to the environmental sound levels of the many products of our company. In all cases, we have presented the information in the form of decibels. These measurements were made at a distance of 50 feet from the working machine, following all applicable recommended practices of the SAE. Where SAE procedures were not available, such as with lawnmowers, the measurements were made on the level terrain at a 50-foot radius from the machine. The highest sound level reading was recorded when the machine was doing its normal job, such as the lawnmower mowing grass. For the purposes of this hearing regarding the broad aspects of "Technology and Economics of Noise Control," we felt that our most appropriate contribution would be to present what we consider tight but attainable goals for the reasonably predictable future.

There have been many forecasts and predictions made, some perhaps a little bit Jules Verneish. We wanted to try to give you a little realistic assessment as we could have what we thought was reasonably attainable.

The future sound level goals by product line which I will be presenting represent the consensus of our sound level measurement and noise control engineers in our various product divisions and our research center. The base point for their projection is, of course, the current 1972 model product from which we have made projections for 1975 and 1978. As we noted in our previous presentations on current products, there is a range of values for various kinds of machines within a given product class. There is, in fact, some variation from one machine to another of the same nominal configuration. Feeling that the focal point of noise control is at the loudest of a given sampling, our thinking was addressed to the loudest in each case. As engineers, we would have been delighted to have been able to derive and present some precise form of cost-effectiveness measure, even as simple as dbA reduction per added dollar of product cost.

Looking into the future and having to assess what might happen, we finally concluded that our basic and collective judgments to be the only workable means, for now, of coming up with projections. They are based on likely technical attainment within reasonable cost impact.

We still have to recognize that these goals or forecasts are probably drawn with a paint brush, if you were to chart them with a bandwidth of a couple of dbA at least in plus or minus, a couple of years in time, plus or minus, also.

We are trying to give you some trends as we see them in terms of practical commercial attainability.

In the following paragraphs our products will be reviewed in a more condensed form than in our previous testimony. They are grouped into broad categories which we feel might be appropriate for consideration for future regulation and enforcement. The means for future sound level improvement have considerable

commonality between various products. Nevertheless, each product class is discussed individually for your consideration.

As shown in table 1, I have chosen to categorize rubber-tired loaders and scrapers as high silhouette equipment. This unique configuration involves placement of the engine fan and much of the transmission elements high above the ground. You will see demands for scale there and you will note where the power sections are, they are substantially above the man.

You will see the man for scale.

In these machines the engine, fan, and much of the transmission elements are located rather high above the ground. As a consequence, there is less tendency for ground attenuation of sound before it gets to the observer 50 feet away. Accordingly, these are the machines of the higher sound levels. We have further grouped these machines into two size ranges; namely, over or under 300 horsepower. The 1972 maximum levels for the large machines run 94 to 97 dbA while the smaller measured in the 85 to 87 range. For both the large and small sizes, our first step improvement to 1975 would consist of fan and exhaust system improvements along with some degree of engine shielding.

Now as we have noted before, our machines all are muffled as far as mufflers are concerned. But now we are getting into where these other things are very pertinent.

The next step to 1978, we would expect to achieve by further shielding of the engine compartment, and in some cases further exhaust system improvements and/or possible engine modifications.

Our next category, crawler tractors and loaders, shown in table 2, is also presented in two groups, with 160 horsepower being the dividing point in terms of the class of these vehicles. The measures we would expect to take here would be somewhat the same as the preceding.

You will note we are starting out at the lower levels, and we are projecting lower levels in the preceding ones, and the fact that we can do this is due to the previously mentioned grouped attenuation and also there is a lot of natural shielding inherent in the tracks and other elements of these machines.

Now, in the small machine, however, since that is already at the rather low level of 82 dbA, at least is low for construction equipment, we would consider it appropriate to spend our efforts in other areas for a while, and would not look to significant changes here until 1975. Or we would not change it for 1975. We would look for a change to occur in 1978 by improvements again in the fan and engine compartment areas, applying the lessons we have learned in some of the other departments.

The third category of construction equipment is off-highway trucks. These trucks presently have considerable engine compartment shielding inherent in their configuration.

Now, again, they start out at a fairly respectable level of 88. And we can see that we could reasonably and progressively improve them by adding shielding to that. That is already occurring naturally in the machine as well as incorporating again improvements in the cooling fan and muffler.

TABLE 1

ESL OF HIGH SILHOUETTE CONSTRUCTION EQUIPMENT dB(A)

	<u>1972</u>	<u>1975</u>	<u>1978</u>
LARGE (OVER 300 HP)	94-97	88-90	85
SMALL (UNDER 300 HP)	85-87	84	82

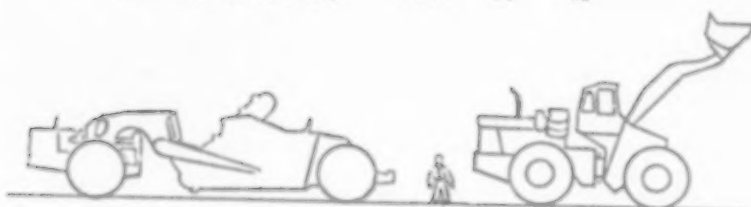
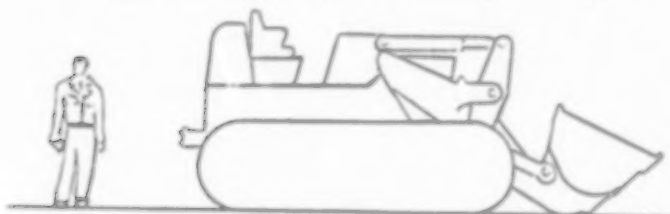


TABLE 2

ESL OF CRAWLER TRACTORS AND LOADERS dB(A)

	<u>1972</u>	<u>1975</u>	<u>1978</u>
LARGE (OVER 160 HP)	88	85	82
SMALL (UNDER 160 HP)	82	82	80



Now we have combined the light-duty machines, such as the light loader shown here and also the backhoes, and the excavators, such as that, smaller machines, into one category.

Now here again since we are starting out even lower, we would save up our energies, and apply the lessons learned on the bigger machines, to drop it down some by 1978, as a reasonable, attainable and economically viable thing for this kind of equipment.

Our next category is the heavy-duty on-road truck.

Now we have many classes of heavy-duty trucks, but we are treating them as one group in that we are looking at the loudest. This would take care of cover and enveloping the long-haul highway trucks as well as the mixer and dump trucks that support construction activity and the full range of diesel power in between, and as just previously noted, the diesel does tend to be a louder engine, inherently.

So we are concentrating our discussion on that class.

Now as we previously testified, these trucks are currently configured to meet local requirements such as in California, Chicago, of 88 dbA. That is our starting point, naturally. We are regulated there and we are producing our products accordingly. The trucks already have certain improvements, put in specifically to get there, fairly good muffling systems, and improvements in the cooling fans and in some cases we are already shielding or putting in acoustical barriers for the purpose of sound attenuation. That is just to get to the 88. So it is going to be a difficult job to make the improvements shown for 1975 and 1978, even though it is only a couple of decibels per step.

We expect to get to the 1975 improvements by just doing more of what we have already done, but then the next step would have to come with some improvements in the engines themselves, either by modification or add-on devices, we feel. We think by that time those things should become at least to some degree a reality by then. The economics of heavy-truck operations dictate, though, that as little as possible be done with the brute force of shielding with leaded vinyl or anything else because the weight comes right out of payload when gross weight limits are considered.

Further, it is—this is not in the text, but it goes almost without saying that other things can happen that would lengthen the truck and cut down on the payload available when your volume limited by a length limit on the truck.

Now, the numbers, then, really, in Table 5, could be lower if we didn't have these other restraints that are particularly felt in the truck. Weight control in these vehicles isn't quite as critical as aircraft, but believe me, truckers are very chary about an extra hundred pounds here and there. And in fact of course, even today, and in the future, there will be many trucks at levels below this but we think this is a good envelope.

Now for agricultural equipment, as we noted in our presentations in Denver, there is a wide variety of powered farm equipment, but much of it is special purpose, and consequently, some of it is used on a very narrow seasonal pattern, and this is the case, for example, in the self-propelled combine type of harvesting

TABLE 3

ESL OF OFF-HIGHWAY TRUCKS

dB(A)

<u>1972</u>	<u>1975</u>	<u>1978</u>
88	86	84



TABLE 4

ESL OF LIGHT CONSTRUCTION EQUIPMENT

dB(A)

<u>1972</u>	<u>1975</u>	<u>1978</u>
85	85	83

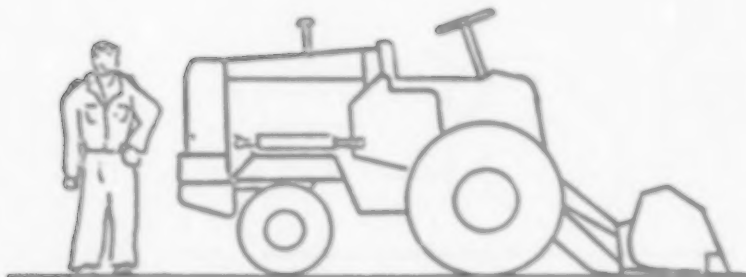


TABLE 5

ESL OF HEAVY DUTY TRUCKS

dB(A)		
<u>1972</u>	<u>1975</u>	<u>1978</u>
88	86	84

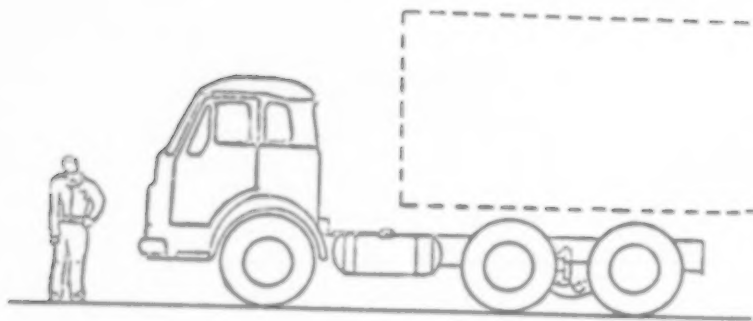


TABLE 6

ESL OF FARM TRACTORS dB(A)

	<u>1972</u>	<u>1975</u>	<u>1978</u>
TILLAGE MODE	88	86	84
PLANTING, MOWING, ETC.	82	82	80

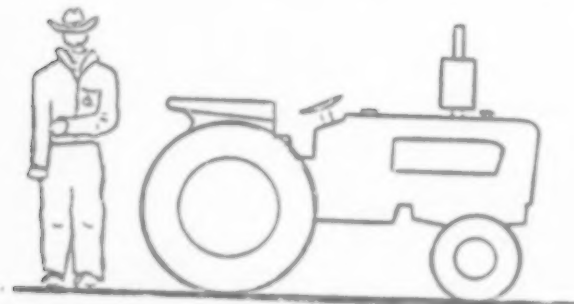


TABLE 7

ESL OF LAWN AND GARDEN TRACTORS dB(A)

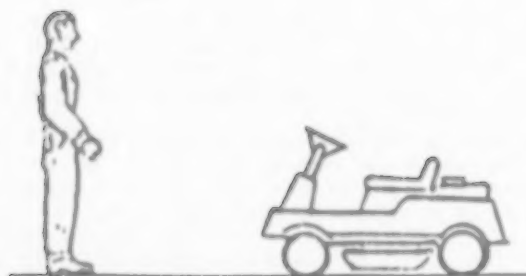
	<u>1972</u>	<u>1975</u>	<u>1978</u>
MOWING	78	76	74
SNOW BLOWING	81 - 84	-	about 90



TABLE 8

ESL OF RIDING LAWN MOWERS dB(A)

<u>1972</u>	<u>1975</u>	<u>1978</u>
72	70	69



machine. We suggest its previously reported level of 88 to 90 dbA may well be environmentally acceptable when we consider the economics of the situation and the infrequent exposure, and that even generally away from the urban areas.

Now again as we noted before, there is the operator problem, which we control by isolating the operator, and such things as that, which for the farmer is a much more reasonable approach to noise control for the purpose of his own protection, and if there is nobody else around to be bothered, it seems to be a reasonable approach there. But that we feel has a limited application.

Now, since we have been paying attention to the operator station noise for a number of years in farm tractors, the things that we have done have also contributed to the attainment of a fairly moderate environmental sound level as shown in this slide, here, with the tractors, and these are tractors up to 130-some horsepower, operating at a tillage mode when the tractor is really pulling hard, about the same as the on-highway truck, about 88 dbA, and it is passing on.

Now, in the tillage mode—sorry—now these improvements that we have shown in the tillage mode for 1975 would result from continuing improvements in exhaust muffling and cooling fan arrangements, primarily. To go on to 1978 we would have to get into considerable shielding of the engine compartment. That leads to many problems in agricultural equipment.

For example, in some of our combines, we have had problems where the engines are shielded in this case, and it is a matter of installation, cooling arrangements, and such. And because of the chaff and other things blowing around, debris accumulates and you have fire problems. So shielding these open-sided engine compartments in farm tractors is not something to be approached lightly, it has to be done with a great deal of care about debris.

Now in the cultivating, planting, mowing, other modes of operation, the tractor, where it is being less vigorously exercised, we would not expect soon to improve the current level of 82 dbA. But we would expect to realize the 80 dbA reduction in that mode, a reduction to 80, primary as a consequence of the things that we would be doing for the tillage noise removal.

Our lawn and garden tractor levels are shown also in two modes of operation, mowing and snow blowing. We feel greater attention is appropriate to mowing in that there is lower frequent use through the summer mowing season. Further the windows and doors are frequently open and people are engaged in more outdoor activities. dbA reductions shown here are expected to be from progressive improvements made by acoustic treatment of mower housings, shielding or shrouding of engines and improved exhaust systems.

Now, if we end up stepping down to about 74, by 1978—we hope to. Further reduction beyond that level, we really don't think we are going to get to until there is some breakthrough in technology on large rotary mower design, achieving the function of both cutting the grass and plowing the cuttings either to the side or into a bag is within the known state of the art, going to require more blade tip speeds that make a little noise.

Now we are hopeful of obtaining significant improvements in the state of the art but at this stage we just don't know how to schedule the invention required to get there. We are optimistic but we can't lay a calendar to it.

For the lawn and garden tractor equipped with a snow blower you will note we have quite a spread from the 81 to 84 dbA. This variation is accounted for by the fact that the snow blower operates on a variety of modes and conditions, depending on the density, depth of drifts, so on, so you have to give that kind of a wide band right now, and our evaluations then are just not definitive. But we do feel that by 1978 the level can be brought down to something in the order of 80 dbA as we have indicated roughly. This would come from previously mentioned basic tractor improvements along with treatment of the snow blower housings and spout. We think there is quite a bit to be gained there.

Now as shown in Table 8, the current sound level of riding lawnmower, our final class and our smallest line of equipment, is about 72 dbA.

Now, as with the lawn and garden tractor we are looking to continuing improvement by acoustic treatment of the mower housing, engine exhaust and shielding and shrouding of the engine.

Now we appreciate the opportunity to present these thoughts and recommendations. We also appreciate the efforts of the EPA in conducting these eight hearings on noise abatement and control. I am sure Al Meyer is going to be glad when it is over.

Further, the International Harvester Co. is most concerned that the control of the environmental sound levels be developed as close to a cost effective basis as we all know how. I feel this is demonstrated by our participation in five of these eight hearings. We look forward to a continuing and working relationship with the Office of Noise Abatement and Control and stand ready to try to provide further information and support as you may require. And to that end, Dr. Meyer, we are looking forward shortly to be able to present to you a little bit more information than you have been getting on our truck surveillance activities.

We have been running these things as we can, when we can run a truck by one of our standard sites again, and we have run a variety of trucks in addition to a variety of sites and we think we are getting a bit of mosaic to show you as soon as we get more data reduction on the rough results.

Dr. MEYER. We are most appreciative of that, Mr. Ringham.

The record should show that what Mr. Ringham is referring to is some individual investigations which his company has undertaken to attempt to improve the state of knowledge with regard to application of highway test motor vehicles, sound levels associated with them, modifications of existing procedures, which require certain very difficult-to-locate systems sites.

I think it is a very noteworthy contribution of his company to attempt to develop a means of enforcement or a tool for enforcement.

We want to keep in touch with you, and we do appreciate that along with the rest of the things you have been doing.

Before asking the panel if they have any questions, Mr. Ringham, the figures that you have presented here, are they essentially different from some of those which the National Industrial Pollution Control Council has developed, or are they comparable, or what?

Mr. RINGHAM. I believe you are referring to the ones for the recreational and similar devices?

Mr. MEYER. Yes.

Mr. RINGHAM. Yes, they are different, in that they do not go out as far. They are based on a consideration of possible ways of getting there.

It may be a little out of place, but I feel compelled to observe that in doing some checking into that subject after we were asked about it in Denver and were caught surprised—we felt maybe we were the only ones left out and we were the black sheep of the family, not being in on what we thought was a consensus development—but we have found it very difficult to find very many people that participated in that, and therefore, that was one of the factors that made us extremely anxious to have this opportunity to present our thoughts in terms of what we think is reasonably attainable that will still leave products that all of our collective customers, ranging from capital goods buyers to people buying lawnmowers, can reasonably afford and still achieve some positive step forward in getting progressive improvement in the environmental sound levels.

Dr. MEYER. Thank you very much.

Mr. Berland?

Mr. BERLAND. You said at the beginning that these were measurements made 50 feet away, and because we are also concerned with noise at the operator's expense too, I wonder how you can translate?

Now, in one of your illustrations you have a closed cab, besides the trucks.

Mr. RINGHAM. These, of course, are schematic illustrations not intended to portray the detail we have previously shown.

Operator noise we did not think was quite the key subject of these discussions. It involved aspects, with most of our capital goods equipment at lows, that are subject more to the Department of Labor, and therefore, we did not address that subject at this time.

We have been doing, as I did mention, partly in the text and partly by ad lib, considerable work in operator environmental noise, and in fact, in some of our machines, the noisiest ones, in fact, the operator is better off than the guy standing 50 feet away.

Mr. BERLAND. So what you are saying is that you complied your still equipment to whatever the standards are under the Labor and Safety Act, is that it?

Mr. RINGHAM. Yes, Well, let's say, of course, the way the act is written it relates to ear protection requirements, but if you take the 90 level, for example, as a point of reference, where you can go for 8 hours without ear protection, that is our design objective and attainment in all of our enclosed configurations.

Now, this does not mean that we can always encourage our customer to buy that enclosed configuration, particularly in the case of farm equipment. But we try as hard as we can to get people to adopt it and to educate them. But there are a lot of people who like to buy it without, and in a competitive world, if the guy wants it without, he gets it without.

We do not sell without mufflers.

Mr. BERLAND. But the farmer who is not in interstate commerce does not come under the law.

Mr. RINGHAM. I was thinking of the farm employee, and I believe the act does extend itself now to rather small employment.

Dr. MEYER. Yes, it does, to farms employing over 10 employees.

Mr. BERLAND. That is a pretty big farm.

Mr. RINGHAM. There are a lot of big farms back in Illinois.

Mr. WISE. Not as big as Texas.

Mr. RINGHAM. And down in Texas, too.

Mr. BERLAND. I have one other question.

Dr. MEYER. Go ahead.

Mr. BERLAND. It is interesting to think on your table 75—1972 to 1978—why 1978? Why don't you do them all by 1972?

Mr. RINGHAM. First off, we do not know how to do all these things. First of all, if we did all this immediately, we could completely offset our economics, and our costs to our customers, and possibly our chance of staying in business.

These are changes to install by evolution, not by revolution, we think.

Mr. BERLAND. I do not think any of these changes are revolutionary.

What you are saying is that they would be additional costs to production?

Mr. RINGHAM. I hope you are recognizing that 3 dbA is reducing energy level by 50 percent.

Mr. BERLAND. It is still only 3 dbA.

Mr. RINGHAM. We consider that is significant, and when you try to work with hardware, you find out how significant that really is.

Mr. BERLAND. That becomes a value judgment between you and me.

One other question: When you are talking about power mowers and rotary mowers, I am wondering about reel mowers, whether you could not achieve more by changing to reel mowers?

Mr. RINGHAM. This is true. Reel mowers have a lot of definite limitations. A lot of the so-called farm and garden tractors are used in bushy areas, and I do not think you would find a reel mower would hold up more than 5 minutes.

Mr. BERLAND. In terms of the length of the grass?

Mr. RINGHAM. Length of the grass, the debris in it, et cetera, wood pieces, hill objects in the ground that get carved off, things that would completely jam up rotary mowers—I mean reel mowers, I am sorry.

Mr. BERLAND. But for home use on a lawn—

Mr. RINGHAM. There is a variety of application these things get to, and the reel mower has its place.

But it is generally on things that are more like a golf green and a lot of large estates and that, particularly if you get the larger garden tractors. Invariably even the regular mower gets quite a bruising.

Mr. BERLAND. Certainly even the riding mower could go to a reel, could it not?

Mr. RINGHAM. It could and there are reel-type mowers.

Mr. BERLAND. They are quieter?

Mr. RINGHAM. They are quieter. They also do not get as close to it, and things, and people do not buy them, and they also cost more.

We offer those as attachments to our tractors, but we do not sell many.

Dr. MEYER. Mr. Eldred?

Mr. ELDRED. I noticed on a couple of pieces of equipment where you can use shielding or some definitely new added feature; you are getting up to say 10-decibel reduction over this period. And you mentioned a couple of other pieces of equipment you are going to run into a new threshold when you get down to your 1978 projected.

But the average equipment seemed to be around 4 decibels, being typical over the 6-year period, which kind of works out to a decibel every $1\frac{1}{2}$ years, which is not quite as good as achieved in aircraft over the last 15 years where I am sure quite a bit more technical effort has gone into it.

Mr. RINGHAM. If you want me to start from ground zero, I could have shown you a lot bigger numbers, for 5 years ago, even.

Mr. ELDRED. The question I had, this is—your progressive trend does seem to be working something like a decibel every $1\frac{1}{2}$ years, and I was wondering if you thought that sort of thing on the grand average, if that would go forward, if that would be typical of the rate this kind of an industry might be able to keep with noise reduction, looking forward, recognizing there will be jumps in any one specific instance?

Mr. RINGHAM. I think if you also look at the numbers a little more, you will find the louder ones do have the bigger steps, and we are tending to get to certain plateaus and you do reach asymptotes.

There is not anything resembling a perfect correlation on dbA levels as a function of horsepower, but there are trends, and the big slugging, bucket-sized piston-type deisels are just going to make more noise than their small counterparts of a couple hundred cubic inches in the farm tractor.

And consequently, these asymptotes or plateau-like areas are going to be at different levels for different classes and types of power.

But even there, where as noted, in things like the rotary mower, after a while, some of the other appurtenances begin even then to get down in making noise.

Dr. MEYER. Dr. Johnson.

Dr. JOHNSON. I think that your objectives here are quite commendable, and having worked on machinery and noise reduction, I know that it is much easier to put down goals than it is to achieve them.

But nevertheless, I think that we must give consideration to the operator regardless of whether he comes under the Fair Labor Standards Act or not.

Would you agree with this?

Mr. RINGHAM. And we are, as I think our track record would demonstrate.

But the subject of this hearing did not include the operator. We left him out, that is all.

Dr. JOHNSON. In other words, I do not think it is the law that is setting these goals for you, it is what—you are setting some goals you hope are realistic.

Mr. RINGHAM. That is right. We think they are reasonably attainable in this time period.

Mr. WISE. Mr. Ringham, Alaska has us.

Dr. BOLT. If you like snow-covered farms.

Mr. RINGHAM. That is right.

Dr. MEYER. Well, again, I want to thank you for giving us the assistance you have, Mr. Ringham.

We intend to continue to work together to find out much about technology and what can be done in our respective areas.

Mr. RINGHAM. Thank you, sir.

Dr. MEYER. At this point, I recess this hearing until 9 o'clock tomorrow, at which time we will hear from a series of witnesses who will be discussing law and State and government relationships which affect industry and the public.

We are recessed.

(Whereupon, at 5 p.m., the hearing was recessed, to reconvene at 9 a.m., the following day.)

ENVIRONMENTAL PROTECTION AGENCY

PUBLIC HEARING ON THE TECHNOLOGY AND ECONOMICS OF NOISE CONTROL; AND NATIONAL PROGRAMS AND THEIR RELATIONS WITH STATE AND LOCAL PROGRAMS

THURSDAY, NOVEMBER 11, 1971

The hearing was reconvened, pursuant to recess, at 9:10 a.m., Dr. Alvin F. Meyer, Jr., Director, Office of Noise Abatement and Control, Environmental Protection Agency, presiding as chairman.

PANEL:

Theodore Berland, Citizens Against Noise
Dr. John Johnson, Acoustical Society of America
Kenneth Eldred, Wyle Laboratories
Dr. Charles Dietrich, Bolt, Beranek & Newman
Mayor Wes Wise, Dallas, Tex.

Dr. MEYER. I hereby call to order this session of the Environmental Protection Agency's hearings on noise abatement and control being held in Washington, D.C., under the authority of title IV, Public Law 91-604. Since most of the participants have been in session with us before, I will not reiterate the purpose of the hearings.

The panel accompanying me consists of the following distinguished representative of various professions or activities associated with the environment: Dr. John Johnson, president of the Acoustical Society of America; Mr. Ted Berland, president, Citizens Against Noise; Mr. Ken Eldred of Wyle Laboratories; his Honor, Mayor Wes Wise, of the city of Dallas, Tex.; Dr. Charles Dietrich, of the firm of Bolt, Beranek & Newman.

Without further ado I will ask our first witness for the morning, Dr. Louis Mayo, of George Washington University, to come forward and join us.

STATEMENT OF DR. LOUIS MAYO, GEORGE WASHINGTON UNIVERSITY

Dr. MAYO. Dr. Meyer, I have two associates I would like to introduce, Jeff Zimmerman, who is a law student at George Washington University, and Bob Ware, who is a law student at Georgetown University.

Dr. MEYER. Very fine. Glad to have you gentlemen with us this morning.

Dr. MAYO. Dr. Meyer, members of the panel, I am sure that most of what we will have to say this morning is already familiar to you. You have been over most of the problems which are involved in environmental noise, I am sure, with many of your previous witnesses. However, we are pleased to be here this morning in order to make a few observations and to respond to questions that the panel may have.

I would like to invite your attention to page 2 of the paper. This paper is divided into six parts, and I mention this because it is a rather long paper and I have no intention of going over all of it this morning. I would like to reduce it to about 50 percent which I think might be the most relevant part from your standpoint.

Dr. MEYER. Very well, Dr. Mayo. The record will show that this entire submission will be included with the transcript following your testimony so that Congress will have an opportunity to read the entire matter.

Dr. MAYO. Now the main thrust of our comments will go to the possible State regulatory implications of section 6 as proposed, and in some of the pending legislation before Congress. But the idea of inserting the various sections in this paper was to provide a contextual background for section 6.

Part I involves advancing technology and changing social values; part II, environmental noise regulation, current conditions and trends; III, constitutional distribution of regulatory power; IV, advantages of comprehensive Federal noise regulation; V, some possible State-local regulatory implications of section 6(d); and VI, the continuing regulatory task.

Only in recent years has environmental noise gained sufficient attention as a social problem to generate assessments of the situation, proposals for comprehensive public programs of noise abatement, and enactment of a few innovative regulatory schemes. Various factors have forced the problem to the focus of public attention, as for example, the introduction of commercial jet-powered aircraft over the past 15 years and increasing vehicular traffic resulting from urbanization and further stimulated by the interstate highway system.

The decibel level in various noise environments is definitely increasing. But there is more involved than this simple explanation of the growing concern with noise. This can be described as a rather drastic shift in social value priorities. This general concern, of which noise intrusion is but one element, is reflected in various statutory schemes enacted over the past several years of which the most prominent is the National Environmental Policy Act of 1969 which requires, pursuant to section 102(2)(C), the submission of environmental impact statements on "major Federal actions" and which established the Council on Environmental Quality.

However, the value shift reflected in the policies and prescribed practices of some recent environmental quality statutes is not overwhelmingly representative of public attitudes. There remains an extremely strong and pervasive sentiment that such ameni-

ties as a "noise-free environment" are of small significance in comparison with the social utility of the products of technological advance. Judicial decisions provide us with a reasonably accurate assessment of prevailing community value choices. The conventional attitude of the courts has been to view such effects as highway/vehicular environmental pollutants, including noise, as incidental to the principal needs and functions of a progressing technological society and hence, as adverse side-effects which we must accept without complaints.

In the 1968 California case of *Lombardy v. Peter Kiewit Son's Company* (72 Cal. Rept. 240, 244) the court dismissed a nuisance complaint displaying little sympathy for mental, physical and emotion distress, noting that:

All householders who live in the vicinity of crowded freeways, highways and city streets suffer in like manner and in varying degrees. The roar of automobiles and trucks, the chock of hearing screeching brakes and collisions and the smoke and fumes which are in proportion to the density of the motor vehicle traffic all contribute to the loss of peace and quiet which our forefathers enjoyed before the invention of the gas engine.

In other words, seems to me the court considers that these are certain kinds of nuisances that we simply have to put up with and looking back to the good old days is somewhat out of the question.

Now in contrast to this, though, there are more recent court cases, as we point out in the study that we made for ONAC in which the courts are tending to give a great deal more attention to the noise effect as well as other kinds of mental and emotional disturbances.

I will say only a couple of things about part II on environmental noise regulation, conditions and trends.

The existing environmental noise regulatory structure is fragmented in organization and ad hoc in operation. Abatement functions are distributed among Federal, State, and local governmental levels but are largely uncoordinated.

Enforcement of noise abatement State statutes and municipal noise ordinances has been notoriously spasmodic and uniformly weak; in general, noise control enforcement has been placed on already overburdened State Highway Patrols or local police officers.

Now with respect to part III, constitutional distribution of regulatory power: The abatement of environmental noise presents a severe challenge to legal-political improvisation as well as to technological ingenuity. The problem context of environmental noise is a complex one in that noise is not associated with one—or a few—social functions, but is emitted from a vast variety of completely unrelated sources. Many of the most obnoxious noises come from moving sources or from multiple and diverse activities acting in concert. Hence, various techniques (abatement at the source, reduction of effects, or compensation for noise harm) have been devised in an attempt to cope with the multiplicity of sources and affected persons or activities.

It is sometimes said that noise is a "local problem," but this characterization can be a bit misleading. No doubt, noise is a local problem with respect to the effects of noise. It is not necessarily a local problem with respect to the control over the abate-

ment of noise at the source or over the reduction of the magnitude of noise effects.

In the 1851 case of *Cooley v. The Board of Wardens of the Port of Philadelphia* the Supreme Court undertook to determine whether the power of the Congress to regulate foreign and interstate commerce was exclusive of whether it might be in part shared by the States. The Court adopted a rule which placed a segment of control in the States, the test being whether a particular subject or activity of commerce requires uniform national control or whether it is sufficiently local (and unique) in character to permit State regulation. For example, a strong national interest has been asserted in railway regulation. But a strong State-local interest has been recognized in the regulation of the use of interstate as well as State highways.

Part IV, advantages of comprehensive Federal noise regulation.

The *Cooley* doctrine has customarily been applied to specific issues or a Federal versus State-local conflict over the regulation of a particular activity. But as previously noted, the environmental noise context encompasses a multiplicity of particularized problem areas. Nevertheless, the basic rationale of the *Cooley* doctrine underlies section 6(d) of one current legislative proposal (H.R. 11021, 92d Cong., first sess., Sept. 30, 1971) which recites:

(1) Subject to paragraph (2), no State or political subdivision thereof may adopt or enforce, with respect to (A) any new product for which a noise emission standard has been prescribed by the Administrator under this section or (B) any component incorporated into such new product by the manufacturer of such new product, any standard setting a limit on noise emissions from such product which is not identical to the standard prescribed by the Administrator.

(2) Nothing in this section shall diminish or enhance the rights of any State or political subdivision thereof to control, regulate, or restrict the use, operation, or movement of any product.

This section (and a similar provision in H.R. 5275, 92d Cong., first sess., March 1, 1971) clearly recognizes that national uniform regulation of certain activities (industrial processes and commercial operations) is required to achieve necessary noise abatement objectives while it concurrently provides for a degree of flexibility over other activities which will satisfy the diversity of noise control conditions demanded by multiple (and different) constituencies.

For present purposes, attention will be directed to the advantages of establishing Federal standards and to the implications of such standards for State-local noise abatement legislation and enforcement wherein the relationship is guided by a provision the same as or similar to section 6(d).

In their impressive review of the "Preemption Question" (53 Ky. L. Jou. 289, 1965), Abraham and Loder conclude that "The uniqueness of the preemption cases makes it impossible to decide all of them on a strict precedent basis," but their comment on the congressional role in preemptive legislative situations is of more relevance here:

One must sympathize with the Supreme Court as it tries to resolve preemption questions. It is hard to find legislative intent because Congress is very vague and sometimes it fails to really consider the preemption question or the impact of its legislation upon Federal-State relationships.

The point here is that through such hearings as the ONAC series an effort is being made to provide the Congress with the data upon which it can make an intelligent judgment on appropriate legislation for environmental noise abatement. While section 6(d) may very well be the most satisfactory manner of handling the Federal versus State-local distribution of control over this problem, we need to explore with some precision the necessary, probable, and possible implications, of the preemptive effects of this provision.

One can hardly dispute the efficacy of certain types of strong Federal intervention. Federal standards normally tend to focus greater attention on given social ills and to the urgency of dealing effectively with identifiable problems. Often Federal intervention is the only efficacious means of attacking a problem or segments of a fragmented problem areas such as environmental noise.

For example, Federal standards may take up the slack resulting from local indifference or incapability (for financial reasons or otherwise) to deal with the problem. Further, the establishment of Federal standards is a means of generating an incentive for the responsible public and private sector participants to take effective action.

The last function is strikingly illustrated by the enactment of section 611—"Control and Abatement of Aircraft Noise and Sonic Boom"—in 1968 as an amendment to the Federal Aviation Act of 1958. While there had been clear recognition both within the public and private sectors that aircraft noise presented a problem of increasing concern, this legislation and the subsequent setting of aircraft noise standards for the first time thrust the Federal Government directly into an active program of aircraft noise abatement. This legislation also provided the aircraft engine manufacturers and airlines a compelling incentive to introduce noise criteria into their engine design and airline operations.

One of the major advantages of initiating noise regulation at the Federal level as proposed in pending bills will be the ability—research, development, and testing resources—to enact noise standards which are compatible with the most advanced state of technological feasibility, with economic reasonableness and with adequate regard for safety.

I would like to move over to part VI and then come back to part V.

DR. MEYER. Yes, sir.

DR. MAYO. Before going into examination of section 6(d) I would like to take a look at part VI concerning the continuing regulatory task because this seems rather important to me.

It is a recognized fact that the existing Federal-State-local regulatory relationships are in a situation of substantial disarray. One outcome of Federal intervention may likely be a realignment of the Federal-State-local regulatory arrangements into a relatively symmetrical structure of laws, regulations, and enforcement practices. This will come about in time through the promulgation of Federal standards, through negotiation among various jurisdictional levels, through agreements for Federal support to States and municipalities, and by court decisions (where dis-

putes arise) which will, hopefully, tend to bring the overall regulatory scheme into coherent and workable alignment.

Surely, this development will come about with appropriate consideration being given to the movement of goods and products in interstate commerce and to other activities requiring a substantial level of uniform regulation. But there remains a question of the fashioning of appropriate provisions to assure adaptation of noise regulation to particular State and local concerns. In short, in addition to the promise of Federal standards to shape a well-structured national system of regulation of environmental noise sources, we must keep the primary objective in mind; namely, the arresting of and the eventual reduction in the actual noise made by specific noise sources and the actual decibel levels of significant noise environments.

What is needed in order to assure that the real objective of actual noise reduction is achieved? No doubt the establishment of Federal standards for certain mechanisms, devices, and products transmitted in or operating in interstate commerce providing maximum emission levels clearly designed to lower current decibel levels, promise—through time—some reduction in environmental noise. But supplemental State and local programs regulating the use, operation, and movement of noise sources will be indispensable to effective noise abatement, that is, measurable progress in noise level arrestment and reduction.

We know that most State and local noise abatement programs are relatively ineffective. There are many reasons for this: lack of appropriate model codes, lack of skilled personnel and equipment, and lack of enforcement manpower. The Federal Government will have to give thought to providing assistance of various types if noise abatement is to be effective at the State and local levels.

There are, of course, further dimensions to the environmental noise abatement effort not encompassed in the complex of section 6(d) relationships, as for example, the requirements imposed by section 611 (1968) amendment to the Federal Aviation Act, the 1970 amendment to the Federal-Aid Highway Act, the Airport and Airway Development Act of 1970, and the Occupational Safety and Health Act of 1970. And, of course, section 102(2)(C) of the national Environmental Policy Act of 1969 which requires environmental impact statements for all major Federal actions. These combined initiatives should serve to give greater visibility to the noise factor in various future programs and projects. Furthermore, section 401(c) of the Noise Pollution and Abatement Act of 1970 provides for consolidation of the reviewing function of noise-producing activities by Federal agencies in EPA.

But in order to determine if the actual noise levels of major noise environments are in fact being reduced, it will be necessary to monitor and evaluate all Federal, State, and municipal noise abatement programs. The importance of a continuing monitoring and evaluation system cannot be too strongly emphasized. Such a project would assess on a continuing basis—

The degree to which Federal noise abatement programs are achieving their intended objectives;

The scope and nature of permissible and desirable State and local regulatory schemes for environmental noise abatement and control;

The degree of effectiveness of enforcement of State and local regulatory programs; and

The actual reduction, if any, as of prescribed future dates, in ambient noise levels of particular noise environments and in the operation of specific noise sources.

In sum, a splendid opportunity is presented to administer the noise abatement and control regulatory scheme in a manner consistent with both our social aspirations and our best managerial capabilities.

All right, sir, I will go back to part V now on page 22, some possible State-local regulatory implications of section 6(d).

Having suggested the potential useful impact of Federal standards on technological development as well as on operational compliance consistent with social acceptability, one reservation must be noted. Federal standards may impose more rigorous technological design specifications and prescribed operational procedures in order to achieve socially desirable goals. But this very act also tends to approve mechanisms, device, product design performance characteristics—and even operational use—up to the maximum allowable. This caveat is of importance since it may impose limitations on State and local noise abatement initiatives felt consistent with State-local needs. With this consideration in mind, a brief discussion on some of the possible—and I repeat possible—implications of section 6(d) provision on State and local noise regulation is now in order.

A. STATE NOISE ABATEMENT LAWS OR COMPREHENSIVE ENVIRONMENTAL CODES

1. What might be the implication of Federal noise emission standards for the following types of products, and these are the types of products that are set out in most of the pending legislation: Construction equipment; transportation equipment (including recreational vehicles and related equipment); any motor or engine (including any equipment of which an engine or motor is an integral part); electrical or electronic equipment.

Well, let's go back—what might be the implication of Federal noise emission standards for the following types of products, those noted—on State environmental noise codes, or related vehicular codes, such as that of California which has one provision relating to permissible emission levels at the time of "sale," vehicular noise standards, and another relating to permissible "operational" noise levels, vehicular noise limits?

The California vehicular code, that existing and the amendments that were proposed last year—I'm not sure whether all of those have passed or not. In any event, the California vehicular code has an elaborate system of prescribed—graduated through time—standards, some of which provide for higher "operating standards" than "sale" standards, others which are the same, and still others which provide for lower "operating" standards than "sale" standards. Further, the California vehicle code is a "total vehicle" noise emission standard.

Does the proposed Federal provision for "transportation equipment (including recreational vehicles and related equipment)" or the provision for "any motor or engine—(including any equipment of which an engine or motor is an integral part)" purpose to encompass "total vehicle" noise, including emissions from engine, transmission, exhaust, tires, et cetera?

If not, then what if the combined noise emissions from these separate devices—all complying with Federal standards—exceed the "total vehicle" noise standards of the California law? Would the California standards be preempted? The Federal standards would not have explicitly been directed to the same noise source.

2. Assuming enacted Federal noise emission standards would cover total vehicle noise, will not these standards necessarily preempt in whole or in part those State noise regulations relating to automobiles, trucks, buses, motorcycles, et cetera, which set both quantitative decibel level standards and a graduated time schedule—future year of required compliance—with respect to sales of such products? New Federal noise emission standards simply cannot be consistent with all existing State standards which even now differ somewhat among the States. If this is a correct assumption, then what advice should be given to those States which wish to prescribe new noise regulatory standards prior to the promulgation of the anticipated Federal standards?

3. If the Federal emission standards purport to apply only to the sale to the first ultimate purchaser and thereby preclude the establishment of more stringent State noise standards re sales, might the State, nevertheless, be permitted to establish operating standards which are set at lower levels than the sale standard with respect to place and time?

This requirement would be over and above the usual restrictions set re speed limits, quiet zones, et cetera, by local jurisdictions.

4. Related to question No. 3 immediately above is that of the continuing viability of State verbal or subjective noise control standards.

Would not the retention of verbal standards provide the States a means of assuring that operational noise levels could be kept lower than sale standards which, with respect to some products at least, would be preempted by the Federal product noise emission standards?

Most States have muffler statutes. In the 1966 New York case of *People v. Byron*, the validity of the State vehicle and traffic law section 375 was challenged. This section provides:

Mufflers. Prevention of noise. Every motor vehicle, operated or driven upon the highways of the State, shall at all times be equipped with an adequate muffler, in constant operation and properly maintained to prevent any excessive or unusual noise and no muffler or exhaust system shall be equipped with a cutout, bypass, or similar device. No person shall modify the exhaust system of a motor vehicle in a manner which will amplify or increase the noise emitted by the motor of such vehicle above that emitted by the muffler originally installed on the vehicle and such original muffler shall comply with all the requirements of this section.

The court found that what is "excessive or unusual noise" has become common knowledge to the reasonable man and that the standard is constitutionally adequate, citing the *Kovacs v. Cooper* case. Responding to the defendant's contention that a new section 386 added in 1956 on motor vehicle noise limits established

a decibel sound level defining excessive or unusual noise was a "conscious attempt of the legislature to supply the missing objective standard of the precise quantity of noise prohibited," the court stated:

The addition of section 386 was not an attempt to shore up subdivision 31 of section 375. On the contrary, it makes no effort to amend the earlier provision and the two are meant to stand side by side. One now sets a limit beyond which no vehicle noise may go while the other requires each motorist to minimize the noise his particular vehicle makes within that limit.

The court also noted that the States of Texas and California have statutes virtually the same as section 375 and that the courts in those States have upheld their constitutionality.

5. Even if control over operation of products is retained in the States by the Federal legislation, will not the Federal standards practically (and perhaps legally as an incident thereto) affect the operational noise limits that a State or municipality can set, that is, operational levels could not be set drastically below the sale emission levels?

6. Will not the existence of Federal noise standards as to sale, strongly influence the States to establish reasonably uniform operation standards? While this is no doubt desirable for some purposes—interstate motor freight carriers—does it not militate against the exercise of police power for the best interest of the public as to particular State and local conditions?

I will omit 7 and 8.

9. Even if the proposed Federal standards do in effect preempt existing or proposed State noise emission standards for sale of designated noise-producing products, what type of Federal assistance might be necessary for the effective enforcement of such Federal standards at the State and local level?

Now with respect to municipal noise ordinances or comprehensive environmental noise codes:

1. What State and local regulatory efforts can be anticipated in order to assure that the police power (10th amendment) acknowledged in proposed section 6(d)(2) can be asserted to the maximum possible degree? The assertion that noise control is a "local problem," reserved to the States and their instrumentalities has strong support in that States and municipalities have historically exercised considerable discretion in the protection of the health, safety, and general welfare of State-local citizens.

2. Will defendant noise sources in nuisance actions or in suits for injunction be able to avoid liability if they can show that each noise-emitting device is operating within the maximum permissible noise level prescribed by Federal standards—absent a local ordinance—no matter what the actual interference with the use and enjoyment of plaintiff's land and the diminution in the value of his property may result?

The cacophony of sound may far exceed the maximum for any single product or device such as that from a rock band or any activity—industrial, processing, quarrying, et cetera—which may utilize multiple noise-making products.

But is the implication that municipalities should concentrate their noise abatement efforts on qualifying use and operation ordinances and on the establishment by ordinance or by noise

codes zones of quiet or specified maximum noise levels for significant noise environments?

3. The preceding question No. 2 refers to situations where a multiplicity of sources, each of which is in compliance with Federal noise emission standards, create a noise level which exceeds the maximum permissible emission from any single source.

But what of the situation where the municipality may wish to assure the minimum level of noise from particular sources; that is, a level which is not only lower than maximum allowable by Federal standards but lower than that permitted by ordinance or code for locally controlled noise environments?

Can such noise be regulated through excessive or unnecessary verbal standards similar to the procedure approved by the New York court in the *Byron* case?

Will local courts be likely to uphold allegations of noise as a nuisance in such circumstances?

Or will local and State courts be likely to dismiss such complaints if the particular noise source is operating within Federal standards (absent local regulation as to zones of quiet) or within the quantitative noise levels prescribed locally for zones of quiet even if the noise source is actually a nuisance in the sense that it interferes to a demonstrable degree with the use and enjoyment of plaintiff's property?

The proposed New York City Environmental Noise Code retains "unnecessary and loud" standards for their "precedent value" along with quantitative standards prescribed for specific noise sources.

4. Should model codes be differentiated among cities at varying population levels, taking into account such factors as the probable level of ambient noise, the density of vehicular traffic, the frequency of major construction, and the ability of cities of varying size to finance an effective noise abatement program?

All right, sir.

(The complete prepared statement of Dr. Mayo follows:)

I. ADVANCING TECHNOLOGY AND CHANGING SOCIAL VALUES

Only in recent years has environmental noise gained sufficient attention as a social problem to generate assessments of the situation, proposals for comprehensive public programs of noise abatement, and enactment of a few innovative regulatory schemes. Various factors have forced the problem to the focus of public attention, as for example, the introduction of commercial jet-powered aircraft over the past 15 years and increasing vehicular traffic resulting from urbanization and further stimulated by the Interstate Highway System. The decibel level in various noise environments is definitely increasing. But there is more involved than this simple explanation of the growing concern with noise. This can be described as a rather drastic shift in social value priorities. This general concern, of which noise intrusion is but one element, is reflected in various statutory schemes enacted over the past several years of which the most prominent is the National Environmental Policy Act of 1969 which requires pursuant to section 102(2)(C), the submission of environmental impact statements on "major Federal actions" and which established the Council on Environmental Quality.

However, the value shift reflected in the policies and prescribed practices of some recent environmental quality statutes is not overwhelmingly representative of public attitudes. There remains an extremely strong and pervasive sentiment that such amenities as a "noise-free environment" are of small significance in comparison with the social utility of the products of

technological advance. Judicial decisions provide us with a reasonably accurate assessment of prevailing community value choices. The conventional attitude of the courts has been to view such effects as highway/vehicular environmental pollutants, including noise, as incidental to the principal needs and functions of a progressing technological society and hence, as adverse side-effects which we must accept without complaint. For example, in the 1931 case of *Campbell v. Arkansas State Highway Commission* (38 S.W. 2d 753, 754) the court refused recovery to an abutting landowner who had complained of various inconveniences attendant to the change in a highway grade, stating that:

"We do not think the plaintiff, * * * should recover anything for noise, dust, and matters of that sort, which, in varying form, are incidents to living upon a public highway or street, and, as such, must be borne by all owners of abutting property."

And in the 1953 New York case of *People on Complaint of Gersberg v. Arkow* (204 Misc. 635, 124 N.Y.S. 704, 707, 708) the court held that the ordinary operation of properly functioning home air conditioner did not constitute a public nuisance, commenting:

"The air-conditioning machine is a product of man's constant search for the improvement of his own comfort and enjoyment of life. That its use may cause some annoyance to others does not justify denouncing its use as a criminal. It is an unfortunate truth that virtually every scientific invention has carried with it not only advantages but burdens. The airplane, invented for the purpose of speeding transportation, has become the principal weapon of inflicting death in war. The automobile, designed for man's pleasure, has become the most destructive peacetime weapon. And so it is with many other inventions."

"Unfortunately, progress is not marked by a straight line in a constant forward direction, but rather by a zig-zag course, only the ultimate direction of which is clearly marked. A conviction in this case would not only ignore the way pointed out by firmly established principles in the law of nuisance, but would constitute a vain attempt to arrest scientific progress."

In the 1968 California case of *Lombardy v. Peter Kiewit Son's Co.* (72 Cal. Rept. 240, 244) the court dismissed a nuisance complaint displaying little sympathy for mental, physical, and emotional distress, noting that:

"All householders who live in the vicinity of crowded freeways, highways, and city streets suffer in like manner and in varying degrees. The roar of automobiles and trucks, the shock of hearing screeching brakes and collisions and the smoke and fumes which are in proportion to the density of the motor vehicle traffic all contribute to the loss of peace and quiet which our forefathers enjoyed before the invention of the gas engine."

In the highway/vehicular noise context, courts in those States having considered the matter still hold tenaciously to the proposition that there can be no recovery for noise damage to property owners whose tracts are adjacent to the highway right-of-way but whose property has not actually been physically "taken" through eminent domain (condemnation) proceedings. Courts in the various States have adopted different positions with respect to noise intrusion where there has been a partial, physical "taking" of the plaintiff's property.

The wrenching experience of the courts in confronting insistent demands that noise intrusion is a social harm (or in reciprocal terms, freedom from abusive noise is a social interest) that should be given legal recognition is, perhaps, best exemplified by decisions of the Florida courts. In *City of Jacksonville v. Schumann* (199 So. 2d 727 [1st D.C.A. Fla. 1967] cert. denied 204 So. 2d 327 [Fla. 1967], cert. denied 390 U.S. 981 [1968]), 57 property owners adjacent to the municipally owned Imeson Airport (in a suit for inverse condemnation) sought and secured injunctive relief for reason of noise and vibration nuisance originating with aircraft using the field. But in the subsequent 1968 case of *Northcutt v. State Road Department* (209 So. 2d 710), an abutting property owner who suffered injury from highway construction was denied damages resulting from noise, dust and vibration. In *Northcutt* the court followed the traditional Florida rule that a physical invasion or trespass is necessary for a "taking" before injunctive relief or damages will be afforded to adjacent or abutting landowners. A comment in the "Florida Law Review" (Honeywell, "Eminent Domain: Inverse Condemnation—What Constitutes a Taking?" 21 U. Fla. L. Rev. 257, 262 [196]) on this situation concludes:

"It is apparent that the consequential damage and physical trespass limitation currently in vogue in many States is an attempt to draw an arbitrary line to prevent frivolous claims. But it is at least arguable that yesterday's frivolous claim may have become both real and justified today because of the increased potential of automotive noise and vibration."

II. ENVIRONMENTAL NOISE REGULATION: CONDITIONS AND TRENDS

Among the more significant conditions of the current (1971) environmental noise regulatory situation are the following:

The existing environmental noise regulatory structure is fragmented in organization and ad hoc in operation. Abatement functions are distributed among Federal, State, and local governmental levels but are largely uncoordinated.

The environmental noise problem context is composed of a wide variety of discrete noise sources and noise environments. Numerous partial efforts have been made to regulate "excessive" or "unnecessary" noise through regulatory schemes directed to abatement at the source, reduction of the effects of noise, and to remedies (by private action) to abate the source or to reduce the effects.

Regulation by the Federal Government has been slight. Even with respect to aircraft noise, the pace of abatement at the source has been gradual with no short-term prospects for substantial relief.

Regulation by the States has for the most part been limited to selected noise sources, although some States are now in process of enacting comprehensive noise abatement statutes.

Most noise abatement regulation has taken place at the local level by means of general noise ordinances or ordinances directed to specific noise sources or by the creation of "quiet zones."

Both State and local governmental levels are handicapped in police power regulation of some of the more critical noise sources as a result of preemptive Federal legislation (aircraft noise) or by the threat of impinging upon a strong national interest maintaining the free flow of interstate commerce.

Very little attention has been given to construction equipment or site noise, or to domestic noise sources.

Enforcement of noise abatement State statutes and municipal noise ordinances has been notoriously spasmodic and uniformly weak; in general, noise control enforcement has been placed on already overburdened State highway patrols or local police officers.

While both the Federal Government and State governments have been slow to intervene in the noise regulatory area, certain trends point to a substantially increased level of effort:

Federal level.—Noise abatement (occupational) of all businesses operating in interstate commerce; construction site noise abatement under the Construction Safety Act; highway design to reduce noise effects.

State level.—Enactment of comprehensive environmental quality statutes, including environmental noise abatement codes; enactment of specific legislation designed to control the total emissions of vehicles and to regulate the noise level operations of vehicles.

Local level.—Initial efforts by a few cities to enact comprehensive environmental noise codes covering all or most of the serious noise sources and noise environments subject to municipal regulation; growing sophistication at all governmental levels in noise abatement and control techniques, including the establishment of decibel levels to replace or supplement verbal-subjective standards; increasing disposition to broaden coverage of noise sources and noise environments by regulatory schemes and to disseminate through labeling or by other means useful information on noise dangers and abatement techniques to the general public.

Among the more significant continuing problems in the regulation of environmental noise are the following:

Conflict of the social interest in noise abatement with other social values such as safety or free expression which are accorded higher priority in the scheme of social interests.

Intensification of the stress between Federal efforts and State-local noise abatement efforts, especially in those regulatory contexts where Federal preemptive legislation is involved.

Continuing difficulty by State or local authorities to regulate noise to the satisfaction of local conditions and needs where such regulation requires

control over the noise source or effects of vehicles, equipment, and appliances regularly moving in or operating in interstate commerce.

Continuing difficulty, due to the multiplicity of noise sources and noise environments, of determining what noise sources or effects are to be controlled by what level of government with respect to the setting of standards or to operating procedures, having appropriate regard for the need of uniformity of regulation in some areas and the need for diversity of regulation to suit unique local conditions in others.

The foregoing questions and other relevant inquiries must, of course, be analyzed and evaluated in the context of certain influential conditions and trends which are, in effect, constraints on effective noise abatement programs.

To date, environmental noise as a social problem has been given relatively little organized attention. This area has not been considered high in the priority of public concerns and, for the most part, abatement efforts have been ad hoc and spasmodic. Noise abatement has come into conflict with other social values which have traditionally been given great weight in our overall social value scheme: need for transportation and private mobility, technological progress, and economic expansion.

This general observation can be expressed in more specific social value and institutional terms, as for example:

Just in the last few years have organized constituencies of noise-abused citizens come into being.

Government, at all levels, has been slow to take effective noise abatement action although the growing seriousness of the problem has been recognized for many years.

Industrial and commercial interests have been even more lax than the public sector in taking an aggressive stance toward environmental noise reduction.

Past emphasis on the economic value (increasing production and indiscriminate consumption) with little concern for environmental amenities has encouraged industry to "externalize" social costs of detrimental "side-effects" such as excessive and unnecessary noise.

There has existed an almost crass indifference to the detrimental effects of noise on neighborhood, family, educational, and health care environments.

Overall, the research effort directed to the study of the effects of noise, alternative means of abating noise at the source and the effects of noise, and into various regulatory configurations which would provide adequate means of coping with excessive and unnecessary noise has been modest.

Concomitant to the point immediately above, there is a lack of public understanding of the noise problem and of personnel skilled in the administration and enforcement of noise abatement programs.

III. CONSTITUTIONAL DISTRIBUTION OF REGULATORY POWER

The abatement of environmental noise presents a severe challenge to legal-political improvisation as well as to technological ingenuity. The problem context of environmental noise is a complex one in that noise is not associated with one—or a few—social functions but is emitted from a vast variety of completely unrelated sources. Many of the most obnoxious noises come from moving sources or from multiple and diverse activities acting in concert. Hence, various techniques (abatement at the source, reduction of effects, or compensation for noise harm) have been devised in an attempt to cope with the multiplicity of sources and affected persons or activities. The noise abatement task is further complicated by the necessity to determine at what level of government these various techniques can best be prescribed and implemented.

It is sometimes said that noise is a local problem, but this characterization can be a bit misleading. No doubt, noise is a local problem with respect to the effects of noise. It is not necessarily a local problem with respect to the control over the abatement of noise at the source or over the reduction of the magnitude of noise effects. The noise context selected for control purposes will ordinarily be defined in terms of the noise effects emitted from particular discrete noise sources or identifiable noise environments.

What then is the basic legal-political framework within which the environmental noise problem must be analyzed? Environmental noise is primarily the result of a highly industrialized society. In a most thoughtful book of a few years back entitled "Industrialism and Industrial Man" (1960), the authors state:

"Pluralistic industrialism will never reach a final equilibrium. The contest between the forces of uniformity and for diversity will give it life and movement and change.

"The themes of uniformity and diversity, and manager and managed which mark the world today will characterize it in the future as well. There will be constant adjustments between these eternally conflicting themes, but no permanent settlement. They will constitute the everlasting threads of history: the uniformity that draws on technology and the diversity that draws on individuality; the authority that stems from the managers and the rebellions, however muted, that stem from the managed." (P. 296.)

Our constitutional development seems consistent with this formulation. For example, article I, section 8(3) provides that the Congress shall have power "To regulate commerce with foreign Nations, and among the several States, and with the Indian tribes;" and article I, section 8(8) provides that the Congress shall have the power "To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The 1824 Supreme Court case of *Gibbons v. Ogden* (9 Wheaton 1; 6 L. Ed. 23) gave impetus to the promotion of the commerce clause and interstate commerce by holding a New York law providing for a State "steamboat monopoly" invalid. The subsequent 1851 case of *Cooley v. The Board of Wardens of the Port of Philadelphia* (53 U.S. [12 How.] 299) has had great significance in terms of mediating between the themes of uniformity and diversity noted above. In that case the Supreme Court undertook to determine whether the power of the Congress to regulate foreign and interstate commerce was exclusive of whether it might be in part shared by the States. The Court adopted a rule which placed a segment of control in the States, the test being whether a particular subject or activity of commerce requires uniform national control or whether it is sufficiently local (and unique) in character to permit State regulation. For example, a strong national interest has been asserted in railway regulation. In *Southern Pacific Co. v. Arizona* (325 U.S. 761 [1945]) the Supreme Court, relying on the *Cooley* doctrine held that the Arizona train limit law (limiting train length) contravened the commerce clause, the majority opinion stating that: "Here examination of all the relevant factors makes it plain that the State interest is outweighed by the interest of the Nation in an adequate, economical, efficient railway transportation service, which must prevail." But a strong State-local interest has been recognized in the regulation of the use of interstate as well as State highways. In *South Carolina State Highway Department v. Barnwell Bros.* (303 U.S. 177 [1938]), a State statute limiting the width and weight of motor trucks which was more restrictive than those of most other States was held not to be an undue burden on interstate commerce even though "interstate carriage by motor trucks has become a national industry," the Court stating: "Few subjects of State regulation are so peculiarly of local concern as is the use of State highways." But compare *Bibb v. Navajo Freight Lines, Inc.* (359 U.S. 520 [1959]), wherein the Supreme Court found an Illinois contour mudguard requirement for motor freight carriers to be in conflict with the commerce clause even though such local safety measures are normally not found to place an unconstitutional burden on interstate commerce.

The "States and their instrumentalities may act, in many areas of interstate commerce, * * * concurrently with the Federal Government" and "Evenhanded local regulation to effectuate a legitimate local public interest is valid unless preempted by Federal action, * * * or unduly burdensome on * * * interstate commerce * * *." In general, preemption by Federal legislation is not to be inferred "unless the act of Congress, fairly interpreted, is in actual conflict with the law of the State."

IV. ADVANTAGES OF COMPREHENSIVE FEDERAL NOISE REGULATION

The foregoing constitutional setting focused primarily on the contending authority of the Federal Government pursuant to the commerce clause on the one hand and the police power of the States pursuant to the 10th amendment "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people" on the other. The authority of the States to legislate in support of the health, safety, and general welfare of its citizens has, of course, been used extensively. In many social problem contexts, as previously indicated, the *Cooley* doctrine has provided the fundamental test of the appropriate distribution of legislative power.

The Cooley doctrine has customarily been applied to specific issues or a Federal versus State-local conflict over the regulation of a particular activity. But as previously noted, the environmental noise context encompasses a multiplicity of particularized problem areas. Nevertheless, the basic rationale of the Cooley doctrine underlies section 6(d) of one current legislative proposal (H.R. 11021, 92d Cong., first sess., Sept. 30, 1971) which recites:

"(1) Subject to paragraph (2), no State or political subdivision thereof may adopt or enforce, with respect to (A) any new product for which a noise emission standard has been prescribed by the Administrator under this section or (B) any component incorporated into such new product by the manufacturer of such new product, any standard setting a limit on noise emissions from such product which is not identical to the standard prescribed by the Administrator.

"(2) Nothing in this section shall diminish or enhance the rights of any State or political subdivision thereof to control, regulate, or restrict the use, operation, or movement of any product.

This section (and a similar provision in H.R. 5275, 92d Cong., first sess., Mar. 1, 1971) clearly recognizes that national uniform regulation of certain activities (industrial processes and commercial operations) is required to achieve necessary noise abatement objectives while it concurrently provides for a degree of flexibility over other activities which will satisfy the diversity of noise control conditions demanded by multiple (and different) constituencies.

Reference to proposed section 6(d) and to the activities of the Office of Noise Abatement and Control carried out pursuant to the Noise Pollution and Abatement Act of 1970 reflect the need for more effective Federal regulation of noise sources and effects. This can take many forms: research and development on noise effects, public education in noise effects, requirement for noise to be considered as a design factor in the development of noise-producing systems such as highways, the establishment of maximum decibel standards for products or devices or even for definable noise environments, Federal assistance to State and local authorities in the planning and operations of noise abatement programs, et cetera.

For present purposes, attention will be directed to the advantages of establishing Federal standards and to the implications of such standards for State-local noise abatement legislation and enforcement wherein the relationship is guided by a provision the same as or similar to section 6(d).

Despite the fact that environmental noise regulation poses some difficult questions of public policy and public administration, this challenge should be welcome. An unusual opportunity is offered for the systematic application of available analytical resources to the achievement of a significant social goal. The environmental noise problem is serious but by no means out of control. The comprehensive study conducted by the Office of Noise Abatement and Control and this series of hearings, designed to solicit the opinions of all affected participants demonstrate how independent analytical capabilities can be effectively linked to public participation. Put another way, the incremental, ad hoc development of Federal control over aircraft noise can and should be supplanted by a systematic, comprehensive regulatory approach by the Federal Government which will assure that desirable environmental noise levels will be achieved within a reasonable period of time.

In their impressive review of the "Preemption Question" (53 Ky. L. Jou. 289 [1965]), Abraham and Loder conclude that: "The uniqueness of the preemption cases makes it impossible to decide all of them on a strict precedent basis," but their comment on the congressional role in preemptive legislative situations is of more relevance here:

"One must sympathize with the (Supreme) Court as it tries to resolve preemption questions. It is hard to find legislative intent because Congress is very vague and sometimes it fails to really consider the preemption question or the impact of its legislation upon Federal-State relationships." (P. 333.)

The point here is that through such hearings as the ONAC series an effort is being made to provide the Congress with the data upon which it can make an intelligent judgment on appropriate legislation for environmental noise abatement. While section 6(d) may very well be the most satisfactory manner of handling the Federal versus State-local distribution of control over this problem, we need to explore with some precision the

necessary, probable, and possible implications of the preemptive effects of this provision.

One can hardly dispute the efficacy of certain types of strong, Federal intervention. Federal standards normally tend to focus greater attention on given social ills and to the urgency of dealing effectively with identifiable problems. Often, Federal intervention is the only efficacious means of attacking a problem or segments of a fragmented problem area such as environmental noise. For example, Federal standards may take up the slack resulting from local indifference or incapability (for financial reasons or otherwise) to deal with the problem. Further, the establishment of Federal standards is a means of generating an incentive for the responsible public and private sector participants to take effective action. The last function is strikingly illustrated by the enactment of section 611 (Control and Abatement of Aircraft Noise and Sonic Boom) in 1968 as an amendment to the Federal Aviation Act of 1958. While there had been clear recognition both within the public and private sectors that aircraft noise presented a problem of increasing concern, this legislation and the subsequent setting of aircraft noise standards for the first time thrust the Federal Government directly into an active program of aircraft noise abatement. This legislation also provided the aircraft engine manufacturers and airlines a compelling incentive to introduce noise criteria into their engine design and airline operations.

One of the major advantages of initiating noise regulation at the Federal level as proposed in pending bills will be the ability (research, development, and testing resources) to enact noise standards which are compatible with the most advanced state of technological feasibility, with economic reasonableness and with adequate regard for safety.

V. SOME POSSIBLE STATE-LOCAL REGULATORY IMPLICATIONS OF SECTION 6(d)

Having suggested the potential useful impact of Federal standards on technological development as well as on operational compliance consistent with social acceptability, one reservation must be noted. Federal standards may impose more rigorous technological design specifications and prescribed operational procedures in order to achieve socially desirable goals. But this very act also tends to approve mechanisms, device, product design performance characteristics (and even operational use) up to the maximum allowable. This caveat is of importance since it may impose limitations on State and local noise abatement initiatives felt consistent with State-local needs. With this consideration in mind, a brief discussion on some of the possible implications of a section 6(d) provision on State and local noise regulation is now in order.

A. STATE NOISE ABATEMENT LAWS OR COMPREHENSIVE ENVIRONMENTAL CODES

1. What might be the implications of Federal noise emission standards for the following types of products: Construction equipment; transportation equipment (including recreational vehicles and related equipment); any motor or engine (including any equipment of which an engine or motor is an integral part); electrical or electronic equipment?

On State environmental noise codes (or related vehicular codes) such as that of California which has one provision relating to permissible emission levels at the time of sale (vehicular noise standards) and another relating to permissible operational noise levels (vehicular noise limits)?

The California Vehicular Code has an elaborate system of prescribed (graduated through time) standards, some of which provide for higher operating standards than sale standards, others which are the same, and still others which provide for lower operating standards than sale standards. Further, the California Vehicle Code is a total vehicle noise emission standard.

Does the proposed Federal provision for transportation equipment (including recreational vehicles and related equipment), or the provision for any motor or engine (including any equipment of which an engine or motor is an integral part) purport to encompass total vehicle noise, including emissions from engine, transmission, exhaust, tires, etc?

If not, then what if the combined noise emissions from these separate devices (all complying with Federal standards) exceed the total vehicle noise standards of the California law? Would the California standards be preempted? The Federal standards would not have explicitly been directed to the same noise source.

2. Assuming enacted Federal noise emission standards would cover total vehicle noise, will not these standards necessarily preempt in whole or in part those State noise regulations relating to automobiles, trucks, buses, motorcycles, et cetera, which set both quantitative decibel level standards and a graduated time schedule (future year of required compliance) with respect to sales of such products? New Federal noise emission standards simply cannot be consistent with all existing State standards which even now differ somewhat among the States. If this is a correct assumption, then what advice should be given to those States which wish to prescribe new noise regulatory standards prior to the promulgation of the anticipated Federal standards?

3. If the Federal emission standards purport to apply only to the sale to the first ultimate purchaser and thereby preclude the establishment of more stringent State noise standards re sales, might the State, nevertheless, be permitted to establish operating standards which are set at lower levels than the sale standard with respect to place and time?

This requirement would be over and above the usual restrictions set regarding speed limits, quiet zones, et cetera, by local jurisdictions.

4. Related to question No. 3 immediately above is that of the continuing viability of State verbal or subjective noise control standards.

Would not the retention of verbal standards provide the states a means of assuring that operational noise levels could be kept lower than sale standards which, with respect to some products at least, would be preempted by the Federal product noise emission standards?

Most States have muffler statutes. In the 1966 New York case of *People v. Byron* (215 N.E. 2d 345 [1966]), the validity of the State vehicle and traffic law, section 375 was challenged. This section provides:

"Mufflers, prevention of noise.—Every motor vehicle, operated or driven upon the highways of the State, shall at all times be equipped with an adequate muffler, in constant operation and properly maintained to prevent any excessive or unusual noise and no muffler or exhaust system shall be equipped with a cutout, bypass or similar device. No person shall modify the exhaust system of a motor vehicle in a manner which will amplify or increase the noise emitted by the motor of such vehicle above that emitted by the muffler originally installed on the vehicle and such original muffler shall comply with all the requirements of this section."

The court found that what is excessive or unusual noise has become common knowledge to the reasonable man and that the standard is constitutionally adequate, citing *Kovacs v. Cooper* (336 U.S. 77 [1949]). Responding to the defendant's contention that a new section 386 added in 1956 on motor vehicle noise limits established a decibel sound level defining excessive or unusual noise was a conscious attempt of the Legislature to supply the missing objective standard of the precise quantity of noise prohibited, the court stated:

"The addition of section 386 was not an attempt to shore up subdivision 31 of section 375. On the contrary, it makes no effort to amend the earlier provision and the two are meant to stand side by side. One now sets a limit beyond which no vehicle noise may go while the other requires each motorist to minimize the noise his particular vehicle makes within that limits."

The court also noted that the States of Texas and California have statutes virtually the same as section 375 and that the courts in those States have upheld their constitutionality.

5. Even if control over operation of products is retained in the States by the Federal legislation, will not the Federal standards practically (and perhaps legally as an incident thereto) affect the operational noise limits that a State or municipality can set, i.e., operational levels could not be set drastically below the sale emission levels?

6. Will not the existence of Federal noise standards as to sale, strongly influence the States to establish reasonably uniform operation standards? While this is no doubt desirable for some purposes (interstate motor freight carriers), does it not militate against the exercise of police power for the best interest of the public as to particular State and local conditions?

7. In view of some of the foregoing considerations, how might we go about formulating model codes at the State level?

Should they be alternative model code provisions to accommodate varying State needs?

8. Will not the Federal standards on mechanisms and devices provide some measure of relief for noise-abused citizens who in fact suffer an actual

deprivation in the use and enjoyment of their property as a result of such activities as highway construction but who are denied relief by virtue of State legislation which provides that no nuisance can be found by a court to exist where such activity is carried on pursuant to a State statute?

Put otherwise, the Federal standards (as applied to various construction mechanisms, devices, and vehicles) may contribute some appreciable reduction in the total noise emitted from construction noise environments (sites).

9. Even if the proposed Federal standards do in effect preempt existing or proposed State noise emission standards for sale of designated noise-producing products, what type of Federal assistance might be necessary for the effective enforcement of such Federal standards at the State and local level?

B. MUNICIPAL NOISE ORDINANCES OR COMPREHENSIVE ENVIRONMENTAL NOISE CODES

1. What State and local regulatory efforts can be anticipated in order to assure that the police power (10th amendment) acknowledged in proposed section 6(d)(2) can be asserted to the maximum possible degree? The assertion that noise control is a local problem, reserved to the State and their instrumentalities has strong support in that States and municipalities have historically exercised considerable discretion in the protection of the health, safety, and general welfare, of State-local citizens.

2. Will defendant noise sources in nuisance actions or in suits for injunction be able to avoid liability if they can show that each noise-emitting device is operating within the maximum permissible noise level prescribed by Federal Standards (absent a local ordinance) no matter what the actual interference with the use and enjoyment of plaintiff's land and the diminution in the value of his property may result?

The cacophony of sound may far exceed the maximum for any single product or device such as that from a rock band or any activity (industrial, processing, quarrying, et cetera) which utilize multiple noise making products.

But is the implication that municipalities should concentrate their noise abatement efforts on qualifying use and operation ordinances and on the establishment by ordinance or by noise codes, zones of quiet, or specified maximum noise levels for significant noise environments?

3. The preceding question No. 2 refers to situations where a multiplicity of sources, each of which is in compliance with Federal noise emission standards, create a noise level which exceeds the maximum permissible emission from any single source.

But what of the situation where the municipality may wish to assure the minimum level of noise from particular sources, that is, a level which is not only lower than maximum allowable by Federal standards but lower than that permitted by ordinance or code for locally controlled noise environments?

Can such noise be regulated through excessive or unnecessary verbal standards similar to the procedure approved by the New York court in the *Byron* case?

Will local courts be likely to uphold allegations of noise as a nuisance in such circumstances? Or will local and State courts be likely to dismiss such complaints if the particular noise source is operating within Federal standards (absent local regulation as to zones of quiet) or within the quantitative noise levels prescribed locally for zones of quiet, even if the noise source is actually a nuisance in the sense that it interferes to a demonstrable degree with the use and enjoyment of plaintiff's property?

The proposed New York City environmental noise code retains unnecessary and loud standards for their precedent value along with quantitative standards prescribed for specific noise sources.

4. Should model codes be differentiated among cities at varying population levels, taking into account such factors as the probable level of ambient noise, the density of vehicular traffic, the frequency of major construction, and the ability of cities of varying size to finance an effective noise abatement program?

VI. THE CONTINUING REGULATORY TASK

This recital has suggested several implications for State and local environmental noise control if Federal standards are adopted. Of course, the extent of the revisions which will or may have to be made in existing State and local regulatory and enforcement schemes will be directly related to the specific standards and accompanying regulations which will issue from the Office of Noise Abatement and Control pursuant to new Federal legislation. In this regard, it will be useful in the drafting of such standards and procedures for the Office of Noise Abatement and Control to have an

approximate idea of the permissible noise levels now provided in State-local legislation and ordinances and the number of State and local entities following various patterns of regulation. This information has to some degree already been provided in the ONAC environmental noise study noted above, but a substantial evaluative task will arise for the ONAC in assessing the precise implications of alternative Federal standards on the existing State-local regulatory process. Of course, the critical criterion will be the establishment of standards which will effectively contribute to the braking of the rising noise level and, over time, to the reduction of current noise levels in certain environments. But the ease with which existing State-local noise abatement programs and new State-local initiatives can be incorporated into an overall national program of environmental noise control will be an important factor in the timely implementation of this effort.

It is a recognized fact that the existing Federal-State-local regulatory relationships are in a situation of substantial disarray. One outcome of Federal intervention may likely be a realignment of the Federal-State-local regulatory arrangements into a relatively symmetrical structure of laws, regulations, and enforcement practices. This will come about in time through the promulgation of Federal standards, through negotiation among various jurisdictional levels, through agreements for Federal support to States and municipalities, and by court decisions (where disputes arise) which will, hopefully, tend to bring the overall regulatory scheme into coherent and workable alignment. Surely, this development will come about with appropriate consideration being given to the movement of goods and products in interstate commerce and to other activities requiring a substantial level of uniform regulation. But there remains a question of the fashioning of appropriate provisions to assure adaptation of noise regulation to particular State and local concerns. In short, in addition to the promise of Federal standards to shape a well-structured national system of regulation of environmental noise sources, we must keep the primary objective in mind, namely, the arresting of and the eventual reduction in the actual noise made by specific noise sources and the actual decibel levels of significant noise environments.

What is needed in order to assure that the real objective of actual noise reduction is achieved? No doubt the establishment of Federal standards for certain mechanisms, devices, and products transmitted in or operating in interstate commerce providing maximum emission levels clearly designed to lower current decibel levels, promise (through time) some reduction in environmental noise. But supplemental State and local programs regulating the use, operation, and movement of noise sources will be indispensable to effective noise abatement, i.e., measurable progress in noise level arrestment and reduction. We know that most State and local noise abatement programs are relatively ineffective. There are many reasons for this: Lack of appropriate model codes, lack of skilled personnel and equipment, and lack of enforcement manpower. The Federal Government will have to give thought to providing assistance of various types if noise abatement is to be effective at the State and local levels.

There are, of course, further dimensions to the environmental noise abatement effort not encompassed in the complex of section 6(d) relationships, as for example, the requirements imposed by section 611 (1968) amendment to the Federal Aviation Act, the 1970 amendment to the Federal-Aid Highway Act, the Airport and Airway Development Act of 1970, and the Occupational Safety and Health Act of 1970. And, of course, section 102(2) (C) of the National Environmental Policy Act of 1969 which requires environmental impact statements for all major Federal actions. These combined initiatives should serve to give greater visibility to the noise factor in various future programs and projects. Furthermore, section 401(C) of the Noise Pollution and Abatement Act of 1970 provides for consolidation of the reviewing function of noise-producing activities by Federal agencies in EPA.

But in order to determine if the actual noise levels of major noise environments are in fact being reduced, it will be necessary to monitor and evaluate all Federal, State and municipal noise abatement programs. The importance of a continuing monitoring and evaluation system cannot be too strongly emphasized. Such a project would assess on a continuing basis:

The degree to which Federal noise abatement programs are achieving their intended objectives.

The scope and nature of permissible and desirable State and local regulatory schemes for environmental noise abatement and control.

The degree of effectiveness of enforcement of State and local regulatory programs.

The actual reduction, if any, as of prescribed future dates, in ambient noise levels of particular noise environments and in the operation of specific noise sources.

In sum, a splendid opportunity is presented to administer the noise abatement and control regulatory scheme in a manner consistent with both our social aspirations and our best managerial capabilities.

DR. MEYER. Dr. Mayo, thank you very much for putting together this comprehensive review of the problem that we are faced with in noise control.

Much of the testimony that we have heard in the recent hearings has evolved around the problem of technology, state of the art, something to do with enforcement. But you have put together for use the real questions that have got to be addressed if a successful national noise abatement program is going to be achieved.

I think it is fortunate that we have a panel here that is highly competent technically. We have members who have participated in the development of municipal codes, and we have a city official from one of the Nation's largest cities who has to deal with the problems that you highlighted. So I think some good discussion here with you this morning may help bring out some further aspects of the problem of enforcement.

So without further ado I am going to ask the mayor of Dallas if he has any comments or observations or questions.

MR. WISE. Yes. Mr. Mayo, on page 27, section 2, the third paragraph, could you elaborate on that paragraph for me and elaborate on your concept on zones of quiet?

DR. MAYO. I will be glad to make an observation or two on it, but I also would invite you to address some questions which I will ask my two associates to respond to since they are the gentlemen who have given most of the attention to the State and local level. And I might also say, Dr. Meyer, that they have a small demonstration that they would like to present to you a little later on showing the schemes of Federal, State, and local noise regulatory schemes as they are now.

DR. MEYER. At an appropriate point will you indicate that you would like for them to do that, Dr. Mayo? I will leave that up to you, sir. And, of course, you may use your colleagues in any way you see fit to answer the questions.

DR. MAYO. Paragraph 3 was an effort to really answer the questions posed in point 2 in a rather general way. Now, of course, the use and operation ordinances and even zoning ordinances of certain types are the customary way of regulating noise at the local level, as you know.

But a problem that perhaps I am emphasizing a little too much, but nevertheless bothers me—and that is the Federal standards may go to particular noise sources, but I don't see how the proposed Federal standards quite go to noise environments, and that is a different thing. So zones of quiet is one means of identifying a noise environment in the sense that a certain residential section or section given over to schools or hospitals is to be maintained pursuant to ordinance at a given, say, decibel level not to be exceeded.

But I can envision situations coming up with, well, building sites, any number of situations in which each of the specific noise sources may be in compliance with Federal standards but still the overall level of the noise could be excessive, would exceed the Federal level for any particular noise source by quite some bit.

Now I might point out that in the proposed New York code I think this situation has been envisaged and they have attempted to take care of it this way. I mean, assuming that I understand what they are getting at, that by the new New York code the environment protection administrator of the city would be empowered to protect residents from the harmful effects of unnecessary noise. You see, they are keeping in their verbal standards as well as their decibel levels. "The administrator will also have authority to shut down or order abatement of a device which may not be itself beyond the standards set by the code if that device is a part of a cumulative part of harmful noise sources."

This is not a quotation from the code. This is a quotation from a comment on an explanation of the proposed code.

Mr. MARTIN. I don't want to interrupt, but I wanted to delve on the same point the mayor brought out. I can understand how you can control a construction company working. In fact we are in the process now of putting out a standard in SAE which will do this by putting a noise limit at the boundary of the construction site instead of within the individual vehicle. But let's say for the sake of argument that you get individual vehicles that come into a quiet zone around the hospital. You don't have the control you do over a construction site where you can go after the contractor. How would you do that?

And let me just throw a second part into this and say the municipality trying to do this came up with excessively and unrealistically low vehicle standards for vehicles, and I am not talking about construction vehicles—the truck, the passenger car, the motorcycle, which are normally used by the local populace. How would you control this? Would the manufacturer be forced into a court action continuously with the local user of the vehicle, have no recourse? How legally would he approach this?

Dr. MAYO. Would you state the basic fact situation again that you commenced with?

Mr. MARTIN. In other words, if you have a quiet zone, what I am saying is how does the local fellow who has a car, motorcycle, or truck comply with this, where his vehicle may meet an individual manufacturer's standards, he bought a new vehicle that was satisfactory, yet he violates, he himself violates, but it is not until four or five people like himself violate that you exceed the quiet zone requirement by the summation of the noise. Who gets penalized?

Dr. MAYO. I would imagine in order to police a situation like that it would take a very elaborate type of noise enforcement staff, which seems to me to be an unlikely prospect for the type of situation, the hypothetical that you have just given us. If four automobiles going through the quiet zone do not raise the decibel level above that that is permitted, why, OK, but the fifth one comes along and the fifth one is in trouble. That is what you are saying?

Mr. MARTIN. Somewhat.

Dr. MAYO. Well, all right, assuming that situation were identified, then I see no reason why the proper official could not order the fifth automobile out of the zone. Now that seems a little ridiculous—I mean in the hypothetical that you have given us—but I see no reason why that couldn't be done.

Mr. MARTIN. It doesn't appear very constitutional to pick one out of five when you can't really say his is the one that did it out of the five.

All I am doing is stressing the reason that you have to have a Federal uniform law, and I think it is contrary to what the mayor of Dallas will say, but I can't see State the local municipalities having the ability or the right to put in laws that are unrealistic; and a case like this could be unrealistic because you are not controlling a single vehicle, you are controlling a multiple of vehicles, and how do you control a multiple of vehicles like that where you don't have control over an individual, you have 5, 10, 20 individuals involved?

Dr. MAYO. Well, you pose a very difficult question under some circumstances, but, you know, that's no reason to dodge the matter. We just have to deal with it as best we can. And I disagree with you that it necessarily would be unconstitutional to pick up the fifth man because, after all, they do all have presumably the right of mobility, the right of access to that particular area, but we have got cases in the free speech area where more than one party has wanted the same platform and if they come in at different times then the standard that is used there is first-come-first-served. So I would say that the fifth man would just be out of luck.

Mr. MARTIN. Well, let me ask you a very simple question. How does he know he is going to be out of luck when he comes into the zone? Does he have a flasher that says the zone has now reached the peak, the next vehicle will be caught?

Dr. MAYO. He probably wouldn't. But let's not raise this to the level of a Federal case until we have to. You know, let's assume that most people want to act reasonably and even enforcement officers want to use good judgment, and it would seem to me that this is a situation in which warning, getting information out to the public as to just what quiet zones are, and that sort of thing, is the way that you undertake to handle this situation, because I can't see in this situation that you present that a great deal of harm would occur if the fifth or sixth or maybe even the seventh car went through it.

Now why don't you take another kind of situation in which take certain kinds of heavy trucks or buses, for example, and you simply prohibit their going through zones of quiet. Do you have any trouble with that?

Mr. WISE. No, as a matter of fact, that is done right now in municipalities. They are actually zoned out by reason of size rather than by reason of noise, although as the noise abatement principle becomes more popular that will probably become a reason anyway.

But first of all, let me say though we seem to be in an adversary position I like your idea of zones of quiet. In fact I think from

the standpoint of an official who likes to please the public, for obvious reasons—because I like to get their vote—I would love to have certain areas of the city of Dallas with a sign that said you are now entering a zone of quiet. I think it would be public relationswise most favorable.

We recently started bike trails in Dallas, and the sign is in good taste, it just shows a bike and says bike trail. And it met with great public approval for two reasons; first of all, because we are in an age in which people are popularly taking up bicycling, and second, it implies, without coming right out and saying it, people who are riding these bikes are keeping the air cleaner.

And I think if you had certain areas where you said "zone of quiet" or "quiet zone" or whatever, that people would meet it with approval and would be likely to call their friendly city councilman when somebody violated that quiet, and in that way I think it would help.

But as far as in a court of law, I think he has got a very good point there. As far as in a court of law saying you have broken this law and now we are going to take you to court, you probably would not be able to follow through on that because of the constitutional question. But you would still be accomplishing what he is wanting.

Dr. MEYER. Dr. Dietrich.

Dr. DIETRICH. I would like to address my question to Professor Mayo to the very good discussion that he presented on the issue of what you call 6(d), which is the preemption problem. And I noticed in reading the administration's bill, H.R. 5275, and then reading the bill from the Rogers committee, H.R. 11021, that there is a difference in wording between the two. And specifically I would like to draw your attention to the introduction of the word "new" in the latter of these bills, that is H.R. 11021. Would you change any of the statements or formulation of the issues that you have raised in your presentation because of the introduction of that word "new," and I will just read that. "No state or political subdivision thereof may adopt or enforce with respect to (a), any new product for which a noise emission standard has been prescribed by the administrator under this section," et cetera. And that, of course, in contrast to the prior formulation in the administration bill, "no state or subdivision shall adopt or enforce with respect to any product for which noise generation standards have been prescribed."

So you think that makes a substantial change, or could you comment on this?

Dr. MAYO. Well, first my questions concerning section 6(d) were with respect to the Rogers bill involving a new product, and that is the assumption that I have made in these questions.

I really haven't thought—I will tell you, in all of our analyses, or at least my own, I have assumed what was meant was a new product, and I am not sure—I just haven't looked into the administration bills, the implications of that with respect to section 6(d).

Dr. MEYER. I think I can address myself to that. Although the administration bill was silent on this, our testimony given before the subcommittee both in the House and in the Senate was

that it was clearly not intended to try to have a retroactive provision for existing equipment or devices. It was never envisioned it would be retroactive. It was always thought of as dealing with new products. So the substitution of the language in the version of the bill reported out simply reflected the testimony that we had given.

Other questions? Dr. Johnson?

Dr. JOHNSON. You have asked a number of very good questions, and as a matter of fact, I think you asked 11 major categories of questions, and I would like you to pick any one of those 11 and give us your recommended answer. So you may take your choice. Actually there are 13 listed, but you read 11 of them.

Dr. MAYO. Well, I would be pleased to discuss for a few moments anyway the question that was raised on page 24, item 4, which also has some relevance to question 3 on page 27, and that has to do with the retention of and continued viability of verbal subjective standards along with the introduction of quantitative decibel levels into new legislation, whether it be Federal, State, or local. And after I have made a couple of comments on this, why, I would be glad for my associates here to say anything they wish to because they may have a different idea about it.

But I find the reasoning behind the proposed New York City code as well as the reasoning in the New York case of *People v. Byron* to be rather persuasive. That is to retain at least in some instances verbal subjective standards as well as to introduce quantitative standards. And one reason for my suggesting this is simply a matter of really not knowing how it is going to work out. In other words, I think we are moving into an experimental era. I think we have to do some experimenting. I think we have to have a chance for people to see how these two standards might work together or whether they do not work together.

I think that city councils, State officials, and the courts have got to be given some opportunity to think this question through very thoroughly.

But you see, many people have stated that we certainly ought to adopt quantitative standards, that this is the way to remove the constitutional problem, you see, of not only vagueness and perhaps discrimination as to enforcement and that sort of thing, but that it leads to arbitrariness, et cetera.

However, when you think through now just what is involved in the quantitative standards, setting quantitative standards by no means solves all your problems. As a matter of fact, establishing violations of quantitative standards in court may lead to more difficulties or as many difficulties as applying verbal subjective standards. After all, you might be able to get a judge or a jury or just general testimony in a community that certain kinds of noise is loud and explosive like—I guess it is the Dayton, Ohio, ordinance. You might get agreement on that without any trouble. But if an official who is not really very skilled in measuring noise brings someone in for an offense and you can demonstrate that he really doesn't know how to operate the machine or he hasn't done it in the last 6 months, or something of that sort, why, there may be grave questions raised there than in

simply getting a consensual agreement on what is loud or unnecessary.

Dr. JOHNSON. This might also be a partial answer to the question that Mr. Martin asked a while ago. And I think a very good example that we have all experienced is one motorcycle at a stoplight versus 20 motorcycles at a stoplight. Very likely the one motorcycle would not be brought in, whereas the 20 might well be.

Dr. MAYO. Well, that raises a very interesting question, and I brought up in another way some work that we have done for ONAC, and that is, say, knowing the loudness from a motorcycle group increases tremendously as the number goes up, what might be the basis, if any, for some States, say, enacting laws or cities enacting ordinances which prohibit more than so many motorcycles traveling together. I don't know whether it is enough of a problem to be worried about that kind of thing or not, but it does raise an interesting problem. Say you have a motorcycle club of 20, but only six can be permitted to ride together. I am not sure what sort of difficulties that raises.

Dr. MEYER. I think that also leads to the nub of the usage question. Let's get away from motorcycles a minute. Let's go down to K Street and let's say that there are 17 buses passing in 10 minutes time, and the municipality is saying even if it doesn't own the transit system—if it owns it, it could certainly regulate it—can it say there shall not be more than three buses in one city block? You see what I am driving at? Or could it say there shall not be more than three trucks of over 10,000 pounds in a city block at any one time in a 35-mile-an-hour zone?

Dr. MAYO. I can't say that that is on its face unconstitutional. I think that the problem would have to be considered by whatever governing entity is considering it at the State or local level, for example, because there it would not simply be a matter of whether you can prohibit, say, more than so many trucks or buses being in the area on a basis of noise. You would have other kinds of considerations that would definitely come into play, economic considerations, and access to public transportation and mobility and a great number of things which would have to be thrashed out there. If it were arrived at after full discussion and did not appear to be an arbitrary decision made, why, I see no particular reason that kind of an ordinance might not stand up.

Dr. MEYER. Mr. Berland.

Mr. BERLAND. I very much appreciate this rather detailed discussion you have here. I think you asked more questions than you answered obviously.

I have a couple of questions that I did want to ask.

We have in Chicago, as you have in New York and probably here in Washington and other places, a situation where you really don't have one municipality standing isolated by itself. You have a metropolitan area. And that raises all kinds of other problems, and I will give you just two I would like your thoughts on.

No. 1, my own neighborhood, because I live outside of Chicago—Skokie abutting to the west and Evansville abutting to the north. There is in my community one particular area of single family

residences which is zoned that way, and it is right up against the city limits. And about 100 feet on the other side of the city limits is Skokie, Ill., an area which is zoned heavy industry. You can imagine what is happening. There is a steel tube plant in Skokie that operates day and night, and the poor people who live on the other side of the city line of Chicago in the single family residences have no relief.

The city of Chicago has an ordinance. Even before the ordinance was effective, July 1, there was an ordinance that had been in effect much longer that regulated the amount of noise that could be produced by an industrial zone in the city limits. The extent was 1,500 feet beyond the city line. How they enforce it is a nice question. People who live in the single family residences have gone to the city, and the city said "well, we will try and enforce the law." They have also gone to Skokie, and Skokie says "well, you know, it is heavy industry." And it goes on and on. It is like what we call ping-pong politics in Chicago, unlike ping-pong diplomacy.

So they are in a situation where obviously some agency above and beyond the two municipalities is going to have to provide some relief. So far the State of Illinois—maybe that is the correct agency.

That is one problem, and I am sure you have similar problems in Dallas and Washington and New York, name any metropolitan area.

The other problem is we were talking about buses a minute ago, and I can think at least in large cities like New York and Chicago, the municipality in fact does not own the urban transportation system in Chicago. The Chicago Transit Authority is chartered by the State of Illinois. In New York it is the New York Port Authority. So we have this situation in Chicago where we have a new quantitative ordinance that went into effect the 1st of July which regulates the amount of noise of motor vehicles and other things, and you have a situation that buses and the Chicago Transit Authority are clearly in violation of the ordinance, and the city of Chicago is clearly unable to move against this other agency.

Again it would necessitate some sort of legal authority I would think perhaps in the law to provide some relief for citizens for the enforcement of this ordinance, perhaps the ordinance isn't good enough. Maybe we need a State law or maybe a Federal law. I think that is what we are talking about.

I would be interested in your thoughts on it.

Dr. MAYO. I don't see how the proposed Federal laws could help that situation very much other than with new vehicles that were sold which would assure that, I guess, for a reasonable period of time that they operated at apparently decent noise levels.

But what answer can there be to your latter question, if you have an ordinance and there is not either the ability or the resources or the will to enforce it then, it is sort of a useless question in a way because the answer is simple—it just isn't being enforced. It is a violation of the law, I presume. But as is often said in other contexts, why, perhaps the police or the office

of noise abatement, whatever it is in Chicago, has more important things to do, like checking up on church chimes, and that anyway if they step out of line with respect to some really powerful interests when they are first getting off the ground that this might make it more difficult for them to evolve as a really viable organization for noise abatement and control through time.

Mr. WISE. If I may say something here—

Dr. MEYER. Yes indeed, please do.

Mr. WISE. The concept of the council of governments, which is becoming more and more popular and more and more prevalent around the Nation, an organization of the various local entities gathered into one, is probably more important in the field of environment than in any other field. Transit is another. So I believe idealistically speaking you would say that cooperation within those governments and between those governments in making their laws concerning noise abatement uniform would be the answer.

Of course, I am sure that the case in Chicago is going to be similar to what the case might be in Dallas where you might have one out of 38 local municipalities who will be chicken about it and not go in with you, and then you have the problem all over again. But that is the idealistic approach to it, and one I think that is catching on across the Nation and is in practice coming out very well indeed.

Dr. MEYER. The next witness, Dr. Lentz, represents the Washington Metropolitan Council of Governments. I hope he will address himself in his testimony to that approach.

Dr. MAYO. I think Mr. Wise has made a very good suggestion there because this is the way it is going to have to go over the long term if anything is going to be done about the kind of situation that Mr. Berland has described in Chicago. I think, though, this does point out one dimension of the environmental noise problem which I know Dr. Meyer is going to be impatient with, but this environmental noise situation is not going to be worked out over night. We have to look at it in the long range and take steps as we can in graduated phases, though with specific targets to reach within given periods of time.

But the situation that Mr. Berland described, there is just no way to eliminate that problem over night, and you have to look at it in terms of 5, 10, 15, or 20 years maybe in order to get something done about the environmental noise problem.

Dr. MEYER. I'm sure Mr. Berland won't agree that that is a reasonable time.

Mr. BERLAND. I am not as patient. By that time who knows what will happen to that area of the city in terms of private single family residences with unfavorable environment.

May I ask another question?

Dr. MEYER. Yes.

Mr. BERLAND. About your zone of quiet; I find certain attractions in that. On the other hand, I find certain problems. For instance, one has to define what quiet is. You say a zone of quiet. I find some difficulties there as I do in maintaining that part of the ordinance in New York about what is a reasonable noise. You probably have a parallel in speeds—what is a reasona-

ble speed. Speeds are pretty well posted within cities and on highways. There is no sign that says don't go too fast. It says don't go over 30 miles per hour, or whatever.

I would also wonder in your zone of quiet if you had a hospital what do you do about ambulances with sirens, and suppose there were a church in the area—everybody snickered when you said church chimes. I don't think it is so light a problem in a multi-ethnic society. What would you do with church bells in a zone of quiet? I am not asking you for a specific answer. I think these are some of the problems.

Dr. MAYO. Well, there are lots of ways of designating zones of quiet. I mean that doesn't mean a particular or a given decibel levels because we have got graduated decibel levels for various kinds of areas within cities now, or at least which are provided for in various kinds of model legislation, in the Chicago code and others, for industrial zones, residential zones, perhaps others, for hospitals and educational institutions and that sort of thing.

Now there are ways to handle exceptions, and that can be by permitting, for example, where you have to use heavy trucks, for instance, near a hospital or near a school under certain kinds of conditions. After all, if you are going to have new construction somewhere near a hospital or a school, why, some provision has to be made. Now this can be done in terms of times of operation, it can be done in terms of frequency of the operation. But a certain type of permit provision I assume would be most applicable to this situation.

Now on the church chimes I am not about to give any explicit answer on that because I don't know. This is one of the real difficulties in the environmental noise problem, and what is noise to some people is music to others, and that is one of the best examples I think I have seen in some time, because a lady across the street obviously was losing sleep because she anticipated those chimes every 15 minutes and she couldn't get any rest, but the people down the street found it to be a very convenient way of keeping time, I assume.

Mr. BERLAND. Just one last area you haven't approached here, and that is airports, the whole problem of the FAA regulating the airplanes in flight and whether or not the municipalities have a right to regulate the noise of aircraft on the ground. It is a problem you might address your thoughts to some time, but it is a sticky one.

Dr. MEYER. There is a rather lengthy discussion of that subject by Dr. Mayo and his staff in the report furnished EPA. He didn't cover it in any length in this particular discussion, but it is in the report to us that will go to Congress. It is rather extensive, probably the most extensive that I have seen yet.

Do you want to make any brief comment on that, Dr. Mayo?

Dr. MAYO. Well, only in general. Local ordinances undertaking to regulate aircraft flight have generally been knocked down on the basis that the local regulation has been preempted by the Federal Government or on the basis that the local regulation has an undue burden on interstate commerce.

In a couple or three cases, why, a local ordinance has been upheld where it might apply to something like, say, planes just flying for advertising purposes and the elevation at which they have to fly over the city, or they can't fly over a stadium or something of that sort. But that isn't really a very important element. In those cases where municipality has been able to impose regulation to some extent it has not involved scheduled airlines, at least in the cases that we reviewed, because when you get into the scheduled airline problem, why, then even though a regulation which may be reasonable from the standpoint of one airport, the court will always ask well, what does this mean cumulative, if every airport picks up this kind of a reasonable regulation at the local level then what is the overall cumulative burden on interstate commerce?

And since it is clear that the Federal Government has complete control over the safety of air traffic it is extremely—I see very little leeway for local or State control.

I think this is recognized in the new California code on aircraft noise, but I must say that California made a valient effort to try to take advantage of every conceivable alternative for reducing aircraft noise, when actually the control over aircraft noise—it involves the control over operations, as with the Federal Government.

I will make the last point—the control that is in fact and by statute exercised by the Federal Government is far greater than the responsibility that it has accepted for the abatement of aircraft noise.

Dr. MEYER. What about closing airports in terms of hours of operation? Would that fall under what you have just said?

Dr. MAYO. I think for any of the major airports—and after all, what we are talking about primarily are, say, the hub ports, regional ports, large metropolitan ports—the fact that you have international travel and across the country travel and this sort of thing would make it almost impractical, at least according to our own studies and the people that we have talked to, to use this kind of a curfew on large commercial airports.

Mr. WISE. This comes back to a discussion which we had yesterday. As a matter of fact, I was just looking through some of my own notes here. I think it is well known to everybody in this room back in the days when railroads were first coming into existence there were some cities across the Nation which banned railroads. That is banned railroad transportation into their cities, for various reasons, and one of which was noise. And of course, that was back in the days when railroads were as new as the jet aircraft is to us now. And these cities don't exist any more, literally don't exist any more, are phantom cities. So again from a politics standpoint or public official standpoint you have to balance the industry technology with the ecology.

Dr. MEYER. Thank you for bringing that out, sir. I think that is an important point about the fact that noise is not a new problem.

Mr. Eldred.

Mr. ELDRED. I have a couple of questions. I first want to make an observation on this airport situation. There is one air-

port that I am familiar with in California, the Orange County Airport, which has exercised its right as a proprietor and in its agreements—I think it is two operating airlines—the contractual arrangements between the airport and the airlines, there is an agreement there will be no scheduled flights after 10 p.m. to 7 a.m., and that the long-term growth of scheduled flights is going to be limited to some maximum number of flights. This is one example of where apparently the airport has been able to exercise its rights as a proprietor, and to my knowledge FAA has gone along with this rather fully. So I think these rights are possible to be exercised by proprietors.

Getting back to this use principle, there is no question when you look at the environment in a given locality one is talking of a cumulative effect, and am I correct in detecting in your statement perhaps the cumulative principle might be the test of reasonableness and part of the rational basis for a State or local government of actually setting a quantitative standard lower than the Federal source standard? Is that a valid—

Dr. MAYO. Ken, I will have to ask you to restate it. I don't understand your question.

Mr. ELDRED. The question basically is whether you feel that the principle of cumulation of noise which does affect any local environment forms a basis for a local municipality to establish quantitative use standards that are lower than Federal source standards.

Dr. MAYO. I think that would certainly be a justifiable rationale about which to establish quantitative standards. But again I am not ready to give up completely on verbal subjective standards because I think they still may provide us, as long as they are administered responsibly, a degree of refinement over noise abatement and control that we cannot establish, at least not in the near future, with quantitative standards alone.

Mr. ELDRED. I think I would tend to agree it is certainly very desirable. The question comes in establishing a quantitative standard for use. Let's say a quiet zone or any other kind of a zone where we want to maintain a maximum environmental level, we discussed limiting the numbers of things, we discussed the truck traffic. I live about 200 feet from Sunset Boulevard and it would be a very noisy place indeed if trucks over 6,000 gross pounds were not prohibited on Sunset Boulevard and from all that residential area. Unfortunately, although it succeeds very well in keeping trucks out it doesn't do much about sports cars revving up and down the hill, and motorcycles.

If one were to set quantitative use standards, say an arbitrary 70 decibels, something less than the maximum noise level, how does the operator know he is exceeding that standard and does this have any legal implications? You are supposed to have a speedometer and read it. You can't have a decibel meter 50 feet or any other distance.

Dr. MAYO. Well, maybe, though, the best way to try to control noise in that situation—I mean assuming that the community is interested in controlling noise—is to control it through speed limits rather than through trying to measure it by various decibel meters.

Mr. ELDRED. For example, the acceleration from a traffic light, depending on the type of vehicle, you can change your noise output by at least 20 decibels depending on how you handle your throttle.

Dr. MAYO. Well, let me put it this way. The environmental noise problem will be handled, if it is to be handled effectively at all, through a great number of means, not one, and the kind of question you have just asked is a difficult one and there is no pat answer to it that I know of. But I think that an aggregate of techniques, that is like Federal standards abating noise at the source, through the application of State operation and use standards and the education of the public, and the development of skilled noise abatement programs, through a period of time will get something accomplished. And this is the principal reason that I wanted to emphasize a while ago this need for a continuing monitoring and evaluation, not just to see whether the laws on the books may or may not be constitutional. That really is a small aspect. It is whether or not you have a program, including code and office of noise abatement and trained personnel and inspectors who through a period of time will arrest the rise in the noise level and through a little longer period of time will reduce the environmental noise level.

Dr. MEYER. Well, I think that is an excellent statement of what EPA is going to have to do with its Office of Noise Abatement and Control if we are going to have any impact at all on this problem. And we will certainly have to take it at all sources, not just vehicles, but also airplanes and industrial sources.

You mentioned, sir, you would like to have a brief demonstration or discussion by your two colleagues. We have spent an awful lot of time with you this morning. About how long will this take?

Dr. MAYO. Well, I will tell you, I will ask them to take a couple of minutes. It is something that they have been working on for quite a while. I don't know whether it will be of any utility to you, but I want to give them a chance to tell you what they are working on.

Dr. MEYER. We do have a lot of witnesses and we have to get out as close to 5 as we can, but I would like to have this, and I hope you don't feel we have been hammering at you too hard either because we kept you this long, but this is the crux of much of this entire effort that has been evolving.

Dr. MAYO. Well, it is a big area, Dr. Meyer, and I am sorry that I was not able to have quicker answers at the tip of my tongue, but frankly, I have to read back over this stuff every week or so to remind myself what it is about.

Dr. MEYER. Well, we are dealing with the most complex part of the whole thing. We have talked about measurement techniques, and a lot of other things around the country, but this is really the central issue, namely, what are we going to really do about it within the structure of law?

All right, if you have your young colleagues here, proceed. We will be happy to have them.

Mr. WARE. We have been working on this chart for quite a while as a result of our summer study, and it is an attempt to

put as much on one paper as we can concerning the present status of noise abatement regulation in the United States.

Along the side of the chart here we have a list of what we consider to be the major sources of environmental noise, aircraft, automobiles, and trucks, motorcycles, boats, and recreational equipment, commercial noise, industrial, and several other types of noise sources.

Along the top of the chart we have the various jurisdictions we have studied. We have the Federal agencies which we feel have an impact in the area, all the States listed, and a number of cities with which we had correspondence during the course of the summer.

In the little spaces here we have a coding technique by which we attempt to put in symbolic form exactly what the laws are. They include decibel ranges covered by the law, the criminal fine or penalty that is involved.

And when we have completed this chart and have modified with a little bit we will certainly make copies available to you with these codings so that you can understand just what we are getting at.

Now to highlight the status of Federal regulation as it is now, Mr. Zimmerman added some things to the chart that he could better explain.

Mr. ZIMMERMAN. What I attempted to do is—since this is not visible for any more than 6 inches, for your purposes here today I highlighted the areas where the Federal Government has taken some action to the present date. These are all coded on the chart itself. But this just highlights it for our purposes here.

Any square which has a dot centrally located indicates that the Federal Government has taken some kind of objective standard and adopted it in that regard. For instance, here the Federal Aviation Administration Office of Aircraft Noise has certain standards we are all familiar with. I was trying to distinguish in this case authority which is merely research and development type authority such as the Department of Transportation has as a general sense in all transportation equipment.

Second, some of the squares have two dots, indicating that that is some type of in-house Federal activity. In other words, the military or the General Services Administration through their public contracts, et cetera.

What I was trying to do here was give you a feel for the effect of H.R. 11021. And on this second overlay I have indicated those areas where EPA will now have some type of authority to set objective standards; and in terms of the four noise sources that are listed in section 6(a) EPA will be setting standards for automobile and truck noise, motorcycle noise, boat noise and snowmobile and other recreational vehicle noise, through their establishment of sales standards.

Now I think it is important to note here that as I read it, EPA standards will be first sales standards, and there is a certain category of equipment, transportation equipment that will not be covered. For instance, resale equipment, used car sales, et cetera, will not be covered. I think that is important to note when you consider the effect of this bill. Also construction noise was

specifically mentioned in terms of construction equipment that is produced by the bill, and that is located down here. Other sources that are controlled by the bill are motor noise from internal combustion engines, et cetera. And the Rogers committee bill added electrical, electronic equipment now that has some very far reaching effects. That is going to affect commercial noise of a non-advertising as well as an advertising nature through both the motor noise and the electrical equipment noise. It is going to affect industrial noise, and more importantly—and this is perhaps the most important thing—it will be affecting domestic noise through any type of electrical equipment that is sold for use in the home.

And this is an area where if we look underneath we see in the cities surveyed a total of five existing laws that attempt to regulate noise at the local level, no State laws, and certainly no Federal law that attempts to get into this area of noise abatement. So this is a very important step the Federal Government is taking. Also the Federal standards will be affecting sound equipment of a general nature that is not used for advertising, which is important to realize.

This chart I hope will show people the number of laws that will be affected presently by the Federal law.

Mr. JOHNSON. How about all the blocks that have no red? Does that mean there are no laws to cover those things?

Mr. ZIMMERMAN. The blocks where there is no red indicate the Federal Government has not taken any action nor will it be taking any under the new law.

Mr. WARE. Indicates really these agencies involved have taken no action. For instance, this is the Navy, this is the Department of Housing and Urban Development, and these are various different agencies up here. So it really isn't important to have or possible to have all the blocks covered. The important thing is that blocks in different horizontal roles are covered because these are the different noise sources, and in this way, as you can see, many of these are or will be covered by this new bill; and although, for instance, the new bill won't cover aircraft, there is some regulation in other areas of the Federal Government, specifically the FAA, as far as aircraft.

Mr. JOHNSON. What is the one down there that has none?

Mr. ZIMMERMAN. This one down here that has no red block at all, which is the only area of noise we have listed that the Federal Government will not be involved in, is the disturbance of the peace which has typically been recognized as a local matter.

Mr. ELDRED. What is the other that has no star in it?

Mr. ZIMMERMAN. This is operational limits which the new bill will not get into, and I have Department of Transportation listed there which is merely a research and development type of authority.

Mr. WARE. By operational limits, this is transportation equipment. It is often things like the use of horns, various aspects of the operating procedure of basically automobiles. And we found quite a number of these kinds of statutes at the State and local level, which is why we included a separate category which we thought

was important to distinguish it from the general engine noise of this.

Dr. MEYER. Are we going to be able to get a copy of this so we can insert it in the record in pull out form?

Mr. WARE. We will certainly try to get it in that form.

Dr. MEYER. I think it is absolutely essential, just like your big chart, which I would like for you to display, that you have done for part of another study for us. I see you have got some copies of it here—at least let the panel see it, and I would also like for that to appear in the record.* Dr. Mayo, I believe that is what I am looking at over there.

Mr. ELDRED. What is that column on the right that has no horizontal lines?

Mr. ZIMMERMAN. This is the local level. We surveyed 180 cities and got responses from some 83, a fairly good return, we felt. And as you go over—you can't see it from your distance, but there are certain local laws here, the cities that happen to fall in that category near the end of the alphabet.

Dr. MEYER. For the record this particular exhibit is an environmental noise abatement control structure, which was prepared by Dr. Mayo and his associates under a contract with us. It probably is one of the more useful single displays of the entire problem of how to handle regulations. It will appear in the record following this, or at least it will be inserted in the proper way with this transcript.

You are going to try to get us a copy of that?

Mr. WARE. Oh, definitely, yes.

Dr. MEYER. Mr. Martin had a question.

Mr. MARTIN. Dr. Mayo, let me just ask—well, not a hypothetical—in many cases a community puts a law on the books and for one reason or another it does not enforce its own law. The local citizen, of course, has legal recourse, but most people don't have the economic means to take it. Is there a way that an individual—Mr. Berland probably is as interested in this as I—can force a community without a legal action, because most of them don't have the resources, to actually enforce their local ordinance?

Mr. ZIMMERMAN. I would say without taking legal action that they would probably be very curtailed. The only kind of action they could take would be to go to the mayor or police and ask them to enforce the law. Other than that if it is a purely administrative, ministerial function imposed upon some agency of the city there would be the potential for a mandamus action against that particular city official. But that is a legal action that would have to be taken.

Mr. WISE. In many cases just the fear of breaking the law will control the citizen, and in many cases indeed if you did try to take it to court the city probably would not be able to win its case. But the fear of it is still helpful, beneficial.

Dr. MEYER. Well, thank you very much, Dr. Mayo, and your colleagues. We appreciate your willingness to be with us so long, and again I want to thank you very much for a major contribution to our proceedings, sir.

*These charts are printed in NTID 806.4, "Laws and Regulatory Schemes for Noise Abatement," available from ONAC.

Dr. MAYO. Thank you, Dr. Meyer and members of the panel. You asked some good questions. We will have to go back and think a little more.

Dr. MEYER. All right. Thank you very much.

At this point I would like to ask Mr. John Lentz, representing the Washington Metropolitan Council of Governments, if he would come forward.

Mr. DIETRICH. Mr. Chairman, I wonder if I may make a comment with respect to the jurisdiction, and that had to do with a little difficulty between two cities in the Chicago area, and I just wanted to point out that the Illinois Pollution Control Board will be considering soon statewide regulations of the property line noise limit, and these, of course, would fill in the missing gap and difficulty here between two jurisdictions that you cited the same way Federal regulations can help these States. You needn't worry about waiting 15 years.

Dr. MEYER. I hope that Mr. John Moore, who is on the schedule, from the Illinois State Environmental Protection Agency, is here and will talk about this.

Mr. DEITRICH. Mr. Moore said he would not be able to be here, I understand. So that's why I was making that comment, because I believe he is unable to come.

Dr. MEYER. All right. Dr. Lentz.

**STATEMENT OF JOHN J. LENTZ, DIRECTOR OF HEALTH
AND ENVIRONMENTAL PROTECTION, METROPOLITAN
WASHINGTON COUNCIL OF GOVERNMENTS**

Dr. LENTZ. Mr. Chairman, I am Dr. John J. Lentz, director of Health and Environmental Protection of the Metropolitan Washington Council of Governments. We want to thank you for inviting us to share our views on noise abatement with you today.

Since my statement is relatively short I believe I can make my points most succinctly by following along rather than trying to paraphrase it.

Dr. MEYER. Very good, sir. Go ahead.

Dr. LENTZ. The Metropolitan Washington Council of Government is the voluntary association of the 15 major local governments comprising the National Capital region. The membership of COG includes all of the elected and presidentially appointed governing officials of our participating jurisdictions as well as the delegations from the region to Congress and the general assemblies of Maryland and Virginia. COG is also the agency which has been formally designated by the Department of Housing and Urban Development to be responsible for metropolitan planning in the Washington area, and affiliates or subsidiaries of the Council of Governments are likewise responsible for metropolitan transportation and air quality planning and for the initiation of regional solid waste disposal operations.

I would like to also add that we have an active program for the coordination of building codes throughout the 15 jurisdictions in the Washington area.

I am not here today merely to tell you that the Washington region has noise problems—that goes without saying. And I am not here to

describe the complex technical and social fundamentals of those problems either, since the panel is better acquainted with those matters than I am.

While I am uninformed of the content of the legislation before the Congress which the panel has been discussing, I really want to make two points. What I hope to achieve today is to describe to you our sense of frustration as we have tried ourselves to address noise problems, and to encourage you to recommend a coordinated program of research at the national level to discover more about the effects and control of noise and a system of grants-in-aid at the community level to permit timely application of the results of that research in ways that are tailored to the needs of individual communities.

As the seat of our Nation's Government, Metropolitan Washington is a community without heavy industry and with a generally high level of education. Perhaps because of the combination of these factors, it is also a community keenly conscious of its environment and the need for its improvement. Consequently, when citizens become concerned about oppressive noises from aircraft, construction, highway traffic, rock-and-roll bands, and even the family on the other side of the apartment wall, their elected officials in the Council of Governments are quick to take notice and to seek action. During the 4 years that I have been with the Council of Governments I have been under continuing pressure to develop a metropolitan noise abatement program.

And as has been brought out in earlier discussions this morning, if you have a program and if the citizens are behind it then you don't have any problems reasonably enforcing reasonable legislation. If the citizens don't care, no amount of legislation will make any difference.

It is germane to note at this point that the Council of Governments is not funded to undertake major projects of this nature without substantial outside funding. Our base of support is a small per capita assessment solicited from our participating jurisdictions. The funds raised in this way are used to provide local matching for the variety of Federal grants that are available. Our scope of activity is thus limited by the pressures of competing priorities within local governments and by the types of Federal programs for which aid is available and by the competition for available funds.

Within these constraints, the staff of the Council of Governments has been able to do extensive work familiarizing itself with the abstract nature of metropolitan noise problems, and with the development of detailed work programs leading to submission of applications for award of Federal funding, but despite warm words of praise for the proposed work programs, the Council of Governments has been denied the funding necessary to translate programs for work into working programs.

I want to devote the rest of my testimony to detailing the extent of our frustration in attempting to develop a program.

In April 1968, the board of directors called on the staff to respond to a need for a coordinated metropolitan noise abatement program and to offer guidance on the establishment of specimen metropolitan noise abatement ordinance.

In June, the staff responded with presentation for the board's consideration of two basic ordinances: one, utilizing the principle of controlling nuisances, was based on the NIMLO ordinance; the other employing quantified noise levels, was synthesized from similar ordinances then in effect in Hemet, Calif., and Chicago, Ill.

Although the board expressed a preference for the objective-type ordinance, the staff specifically cautioned against adoption of the synthesized ordinance, pointing out both the dangers of arbitrarily translating the specimen noise levels to the Washington area without adequate study of their suitability as well as the associated difficulty of enforcing that type of ordinance. In response to the wishes of the board, however, the specimen ordinance was distributed—and I underline these words—as an item of information only, to participating jurisdictions. In response, as we expected, we received replies, from different sources, that the suggested limits seem(ed) reasonable, that we should proceed with caution pending further information, and suggesting changes and amendments. Based on our 2 months of effort, we had obtained a fairly good, if rudimentary, knowledge of the problems of metropolitan noise abatement, and more importantly, tangible evidence that a fairly broad study would be needed before an effective metropolitan noise abatement campaign could be mounted.

Soon thereafter, the staff had extensive talks with representatives of what was then region III of the Public Health Service in the Department of Health, Education and Welfare concerning the submission of an application for a grant to carry out a noise abatement study under section 314(e) of Public Law 89-749.

The Council of Governments proposed a program to assess the nature and extent of the noise problem, examine successful existing and new control techniques, and develop a noise control ordinance, a noise control section of a land use planning policy, and such other recommendations and programs as necessary. The study was intended to take 3 years, utilize the services of existing staff, a specially formed interdisciplinary noise control advisory committee, and a noise control engineer who was to be hired. The total cost of the proposed study was intended to be \$130,810, of which 25 percent would have been borne by the local jurisdictions within COG.

On January 29, 1969, we were notified that our application had not been recommended for approval. We were subsequently provided with copies of HEW staff review comments and encouraged to modify our application in conformance with those comments and to submit it for reconsideration. The thrust of those comments were that the proposed staff, budget, and time for completion were inadequate to project goals and objectives.

On April 30, 1970, the Council of Governments resubmitted its application for Federal grant funding. In its application, COG stated its intention to identify and reduce hazardous and stress-producing noise in the environment, and that in its effort to do so, it would attempt to determine the noise levels and situations which impinge on community health, safety, and welfare; determine and evaluate noise control techniques which can be brought to bear to reduce and prevent adverse noise levels and situations;

and develop specific noise control techniques which may be adopted and implemented by local, State, interstate, and Federal Agencies, private organizations and individuals. And I have been quoting from the actual grant application.

The program proposed the use of the services of existing staff plus a sound control engineer, a sociologist/psychologist if we could find one, a sound control technician, a planner/economist, and an urban planner. The program was intended to take 3 years and was subdivided into the following fourteen tasks:

- (1) Review literature.
- (2) Inventory current noise control activities.
- (3) Inventory and rank major noise problems.
- (4) Design noise level and opinion surveys.
- (5) Assist local jurisdictions in establishing noise monitoring plans.
- (6) Carry out public education and information activities.
- (7) Conduct and analyze noise level and attitude surveys.
- (8) Rank-order noise problems.
- (9) Demonstrate specific control measures.
- (10) Develop noise control goals and objectives.
- (11) Develop a set of noise control standards.
- (12) Develop a model noise control ordinance.
- (13) Develop a set of local noise control policies.
- (14) Develop a set of action programs and policies which can be undertaken by nonlocal governmental agencies, by private industry and organizations and by individual citizens.

The total budget requested had been raised to \$312,130, of which 25 percent would again be borne by the jurisdictions participating in the Council of Governments.

In July 1970, COG was notified of the rejection of its application, pleading that existing priorities of the comprehensive health services program allowed only those new projects designed to provide primary health care to family units in neighborhood centers to be funded.

In desperation, in March 1971, the Council of Governments responded to a notice placed in the *"Commerce Business Daily"* by the Environmental Protection Agency for a contractor to study the effect of noise pollution. The qualifications of the Council of Governments to pursue such a study were clearly presented, we believe. However, we have not been invited to submit a proposal on the basis of our qualifications, and we must presume that respondents with greater qualifications have been found.

I hope this brief recitation of our efforts to undertake a metropolitan noise abatement program has convinced you of our appreciation for the problems of urban noise, of our willingness and capability to undertake a broad-based attack on the problem, and of our willingness to contribute a fair local share of resources to a program of noise abatement. I have not come here to challenge national priorities, and while I am unquestionably disappointed that none of our attempts to gain Federal support for our proposed programs have succeeded, I do not mean to criticize a health agency for putting its priorities on personal health programs.

However, I am very much encouraged that this serious environmental problem has in fact been made a concern of the En-

vironmental Protective Agency, and I would like now to repeat the point that I made at the beginning of my testimony: we need a coordinated program—research at the national scale to learn more about the effects and control of noise and a system of grants-in-aid at the community level to permit the results of national research to be tailored to local needs.

Now, Mr. Chairman, I have prepared a set of exhibits which I gave to the young man which include for your information, and to support my testimony, a copy of the memorandum that was written by the COG staff concerning this model ordinance that we had developed, a copy of that ordinance, a copy of the MIMLO ordinance which accompanied it, our grant applications plus HEW comments concerning the last one, and finally our letter to EPA asking to be involved in whatever noise program they had at that time.

I will try to answer staff questions. I make no pretense at being anywhere near as knowledgeable as Dr. Mayo.

Dr. MEYER. Very well. Your exhibits will appear in the printed transcript going to the Congress immediately following your statement and the questions and answers.*

Let me say one thing about pending legislation and what it might do to meet your needs. Assuming that Congress does enact the proposals now being considered, EPA would be given the authority to undertake a broad research program and also a comprehensive technical assistance program to provide help to States, cities and regional authorities such as the Metropolitan Council of Governments in a variety of areas of activity relating to enforcement, relating to model codes and ordinances and other activities. At the present time the Agency does not have that kind of authority.

that was mentioned in the testimony was one that appeared in "Commerce Business Daily." The purpose of the request was to gather information to help prepare a report to the Congress dealing with the causes of noise in the United States, expected growth of the problem by the year 2000, the effects of noise on people, and a variety of other well specified subjects. And the proposal by the Metropolitan Council of Governments, while it was a good proposal, simply was not tailored to provide chapters in a report to the Congress dealing with rather specific technical evaluations of all the causes of the problem, and so on. It was viewed that while this was a highly desirable proposal, that it didn't fit in with the scheme of putting together what amounts to—I say it now—amounts to a textbook on noise and noise problems and what can be done about them, rather than how a city might deal with them.

Dr. LENTZ. Mr. Chairman, let the record also show that my citation of our application was not meant as criticism of EPA, because we had a feeling that more than what we could provide was really what was being sought, but is cited only to present to the committee and to the record the extent of the COG interest

So that the record might really be complete, I think we should point out that the request for participation in a study on noise

*These exhibits are on file at the Office of Noise Abatement and Control.

and the local government interest in noise problems in the Washington area.

Dr. MEYER. One would hope, of course, if we get some legislation and some funding for it, that we would be able to do that sort of study not only with the Metropolitan Council of Governments in Washington, but with a number of locations. We have got the mayor of one large city here, who feels he needs help in a particular area. But we would undertake a broad technical assistance program. And what you presented highlights the fact that a lot of coordinated effort and a lot of Federal support other than just passing rules and regulations for standards are needed.

I will start off on my right, Dr. Johnson.

Dr. LENTZ. Mr. Chairman, may I make one comment before we proceed?

Dr. MEYER. Yes, go ahead.

Dr. LENTZ. I would think that the key to my comments was that whatever is done should be tailored to the local community, because I think that before any major effort is made at setting noise standards for local activities—and I recognize that aircraft, et cetera, is something else again—but you need to know first of all what the local people want and what the situation is before you start. These are the two things that you must have, and this is really why we did not recommend to our elected officials that even though we had put together the best synthesized ordinance we could, we felt that without knowledge of what the people wanted and what the current noise levels were it would be highly inappropriate to just select arbitrary decibel standards.

Dr. MEYER. I think I have to completely, 100 percent, agree with what you have just said.

Dr. Johnson.

Dr. JOHNSON. I think Dr. Lentz's presentation this morning here is very appropriate and it is very valuable, and it does elucidate the kinds of problems that those organizations who undertake to do something specific run into. And for the record I have no questions. Thank you.

Mr. BERLAND. I agree that this is very valuable. Particularly it provides another perspective, and that is if cities and metropolitan areas are going to enact anything in terms of regulation of noise you have to study the problem. You just can't go ahead and pass an ordinance or pass laws even though they are all the same for the surrounding community.

I wonder if in terms of the Federal Government whether you would suggest that EPA, as the appropriate authority, set up a series of study teams that would come in and make themselves available to organizations such as yours who would have the expertise, would come in and study the problem, and by consulting with either individual local governments or a selection of local governments such as your own, help them to frame ordinances and adopt those model ordinances they hope would be available to you. What do you think of that idea?

Dr. LENTZ. I think that could be very valuable, Mr. Berland. As we found out in developing and pursuing our applications, it became obvious that there just are not that many capable acous-

tical engineers in the country to come in and really set up the kind of program that we wanted to pursue and really to retain that kind of talent in one metropolitan area.

I think that one or more trained roving teams within EPA that could go to different communities would be very helpful. But one of the products that they would have to achieve would be that before they left they would have to train local people to continue their activities so that their level of expertise in measuring noise and in responding to it in a variety of ways could be continued. It should be a seminal kind of thing, if you understand what I mean.

Mr. BERLAND. Would it be more helpful then to have, say, a local EPA office in a State or metropolitan area?

Dr. LEVITZ. You have identified a difficult problem there, Mr. Berland, that really I should discuss now, and I want to discuss it very carefully.

As EPA's relations with the Nation generally have been proceeding since its inception it has been an organization which is related mostly to States, and in most cases this is a reasonable thing to do.

We find that this does not work well in the Washington metropolitan area because we really have three States. We have Maryland, Virginia, and the District of Columbia; and for reasons which I did not come here to criticize they operate with different philosophy and different emphases, and they look at the problems differently. In Maryland they concentrate on the city of Baltimore which has special problems. In Virginia they concentrate on Richmond, and they leave northern Virginia pretty well out of it. We have difficulty many times coordinating relationships between EPA and the States and the heavy concentration of population in the metropolitan area.

This is also a matter which I believe requires serious consideration and is going to involve some consideration as it affects national legislation, and that is ways of dealing with interstate metropolitan areas.

If you can set up something where EPA can come to the Washington metropolitan area and work with an organization such as ours, with due deference obviously to States' rights and all that, but which will still concentrate on the problems of the metropolitan area directly as opposed to going through the States and through the different philosophies in the States, we might achieve something.

But this, you know, is something we could take all day to discuss and then some. It is a very serious problem that this hearing, that any legislation within EPA should consider.

Mr. BERLAND. I agree it is important, and it is not unique to Washington. We have it in Chicago and New York, and one could go on and name the cities.

Mr. ELDRED. Your comments about the problem in just adopting a synthesized ordinance are also probably applicable if somebody presented a model ordinance. I wonder if you have any feelings or suggestions about what is the minimum level of depth that, assuming one did have a nice model ordinance, one would have to get into in questioning the people in the communities on

what they really want, and how much measurement would you think would have to be done.

Dr. LENTZ. I regret to say that I think it would have to be fairly extensive. You have a great variety of communities even within the Washington metropolitan area, and you have a great variety of circumstances which are impressed on those communities. You have areas perforce where essentially interstate traffic passes through residential communities in the Washington area. The 13th Street corridor, for example, it is a residential community, it is also one of the main computer routes between the Maryland suburbs and downtown District of Columbia. You have got to reconcile that.

You have very expensive, isolated suburbs which will by the nature of their communities require a very high level of quieting and where that level of quieting can be achieved. No matter what you do it is not going to be possible to achieve that level of quieting in the more densely populated and in the more active parts of the region.

How you do this I don't know. I think you are going to need this sociologist-psychologist that we define but may have a hard time finding, and you are going to have to go into the communities. It is going to take a lot of work, I think.

Mr. ELDRED. Thank you.

Dr. MEYER. Mayor Wise.

Mr. WISE. For probably similar reasons to your own I want to be careful what I say for the record also, especially with Dr. Meyer sitting beside me. But I think EPA is going through some growing pains, as you would expect it would. And I just checked with Dr. Meyer—what is it, one year in December?

Dr. MEYER. December 2d.

Mr. WISE. And one of these pains is its relationship to some of the local communities and/or regions. I am willing to overlook some of their mistakes if they are willing to have a little patience perhaps with the local communities and regions which are trying to catch up in this field of environment. And obviously we need to catch up. We recognize that possibility.

I would like for you to give us some indication of your track record to support your feeling that regional agencies—and I certainly agree with you on this—that the regional agencies, COG around the country—in our case North Texas Council of Governments—would be a proper organization to do what you propose or what you proposed in your proposal to EPA. In other words, give us some precedents, is what I am getting at.

Dr. LENTZ. There are several that I could cite. I think I should limit myself to the most obvious, and my references vis-a-vis legislation, et cetera may be somewhat in error, but these are errors of fact which can be checked.

The Council of Governments itself was formed as early as 1957 and called the Washington Metropolitan Regional Conference. I will try to limit myself to just one or two accomplishments which should make the point.

One of its first concerns was water pollution control. And through the efforts of the Council of Governments the local jurisdictions, the District of Columbia and the Federal Govern-

ment were able to cooperate in having an interceptor sewer built from the Dulles International Airport which was then under construction—from Dulles Airport all the way to the District of Columbia pollution control plant. This was a major undertaking.

It so happens that at this very moment there is a Potomac Enforcement Conference meeting which is testifying on the lack of complete wisdom of that step. But in the light of the times this was a significant achievement to build an interceptor sewer all the way from Dulles Airport to the District of Columbia pollution control plant and to keep sewerage effluent which would otherwise be generated out of the Potomac River upstream from the water intakes for the Washington metropolitan area. This may well have been the first major accomplishment of the Council of Governments.

Early in the 1960's under something called the Federal Aid Highway Act there was a requirement that for any kind of transportation planning funding to be provided in metropolitan areas it had to come through a single metropolitan planning agency. The local jurisdictions got together and agreed to the Council of Governments and a subsidiary to be doing this activity.

At the present time we are just beginning work on the first interstate air quality planning agency to be established in the country under the Air Quality Act of 1967. Now it has taken us 3 years to do it, but we now have an informal agreement among Maryland, the District of Columbia, Virginia, and the Council of Governments to form one agency to pursue air quality planning in and for the Washington area.

We are also undertaking, and have been for the past 2 years with success which is more or less like the carrot in front of the donkey's nose—the closer you get to it the further away it seems to move—but we are making progress in establishing an operating regional solid waste disposal system. And this is taking a great deal of effort. In itself it involves a great deal of frustration. But I believe in the end we will bring this to fruition.

These are the kinds of things which the Council of Governments is doing.

We are carrying out right now a water resources planning program for the Washington area under two grants from the Office of Water Resources Research and from the Environmental Protection Agency to apply systems analysis to metropolitan water resources planning. And I would add parenthetically that for the past 8 years as part of the combined transportation, land-use planning process we have developed and brought to near operational capability a demographic population modeling computer program which allows us to test alternative regional development policies to see what their implications will be for where people will be living and what they will be doing, and then to translate this back into the consequences for local government and for the environment.

So that what I think we have, Mr. Mayor, is an organization which has been growing in expertise, in capability, and acceptance among the local jurisdictions. We make no claim to

being omniscient, but like Avis, I guess we try harder than anybody else, and we are willing to put something together and we are willing to listen to our member jurisdictions in trying to frame whatever we come up with.

Dr. MEYER. Charles, do you have any questions?

Mr. DIETRICH. I would just like to follow up a little bit on the question that Mayor Wise brought up which perhaps may be a little more specific with respect to coordinated metropolitan programs that you have done in the past. Have you developed anything that is similar in the following respect—that is that it was a COG-wide regulation or something that you wanted to see adopted by each of the member governments, and how has that worked out? Not necessarily noise obviously, but for some other aspect. Have you developed a regulation?

Dr. LENTZ. Well, in response to your question I must add that I skipped over a very significant part of what should have been a response to Mayor Wise's question, and that is that the Council of Governments did in fact take a great deal of leadership in the air pollution problem in the Washington area beginning in 1959, and it took some time, and I will admit it took a great deal of help from the Public Health Service, but by 1966 the Council of Governments had adopted and had promulgated a model air pollution conference which was a major event at the time because of the impact of that kind of an ordinance.

From 1966 to 1968, it took us about 2 years to get it adopted in all of the urbanized portion of the Washington metropolitan region. Translated, this means that there are two counties which are on the fringes which are working on the problem but have not yet adopted it. But our ordinance has in fact been adopted in the urbanized portion of the Washington metropolitan region.

It concerns such things as drastic control of particular emissions. It concerned sulfur content of fuels. It did a lot of things that did in fact attract the attention of people who would be concerned.

Mr. DIETRICH. So you are saying in essence that you did develop a model ordinance or ordinances with respect to this air pollution problem, and that 13 of the 15 units of local government that are listed in the organization have adopted this?

Dr. LENTZ. Yes, sir.

Mr. DIETRICH. It is definitely a success story, and I am glad to hear it.

Dr. LENTZ. I would like to expand on that for just a moment because it might seem a contradiction if I left it at that.

The District of Columbia has an ordinance which is based more or less as a second generation on the COG model ordinance. What we have was developed, as I said, with a great deal of help from the Public Health Service. In 1967 we had an Air Pollution Abatement Conference here. The recommendations of that abatement conference were substantially the contents of the COG model ordinance, and as a result of the work of Congressman Gude and others, the District of Columbia ordinance is based specifically and by language on the recommendations of the Air Pollution Abatement Conference. But it is important to know

that these recommendations are in turn based on the COG model ordinance.

Mr. DIETRICH. One last question. Is there an ongoing effort to upgrade as new facts become available, or as one or more of the jurisdictions finds that something works better than something else is there a continued role for COG to let the other members know about what is working out and what isn't working out?

Dr. LENTZ. Yes, sir. The Council of Governments, if I may take just a moment, is an hierarchy of committees, and we have committees of elected officials. We start obviously with the whole population and all of the governing officials, but reporting to various committees of elected officials we have technical committees made up of professionals from each of the jurisdictions; and among these we have something called the air pollution advisory board which is made up of those professionals from the jurisdictions. This board meets monthly. We really hope to be able to augment the situation by the actual operational capability of this air quality planning agency that I talked about, because once it is set up we will be eligible for further Federal funding and can acquire staff of our own to carry out the necessary studies and make these recommendations.

Up until now—and I suppose that there would be an argument for up to now being the best way—what has been done has been done on a voluntary basis by these professionals in the various jurisdictions, and this implies a great deal of interest.

Mr. DIETRICH. These people are not permanent staff members with COG, these are volunteer people?

Dr. LENTZ. That's right. These are volunteer people from each of the jurisdictions. And, of course, we have this in all the activities that we are concerned with. We have everything from police chief committees to water resources professionals, to task force on narcotics control. We have people that are interested in all facets of urban life.

Mr. DIETRICH. Thank you.

Mr. WISE. Very, very briefly, I think probably the panel—I am very familiar with COG, of course, and perhaps the other members of the panel might not be. We recently had a situation in our community where two of the smaller communities dropped out of COG, and they came under very, very heavy criticism both from their own citizenry and from the local editorial pages actually. And one of the very important aspects of criticism was that in this field of pollution—although I think people were thinking more in terms of air pollution at this time—in this field of pollution they would be just as much responsible to the overall region as would be Dallas, et cetera. So the importance of COG within such an operation as you described here is very, very important.

Dr. LENTZ. Well, there is also a financial incentive, as you are aware, Mr. Mayor. Those jurisdictions in a metropolitan area which do not participate in the metropolitan planning process lose certain override grant features with regard to water and sewer construction, et cetera. This at present is really outside the natural civic virtue; this is a major financial enticement we have for jurisdictions to participate.

But I think in the long run that natural civic virtue shows itself in our jurisdictions. They participate because they want to, because they see the advantages of it, and we have a very active group of elected officials in our Council of Governments.

Dr. MEYER. Well, very fine, Dr. Lentz. We appreciate your presentation and your suggestions, and they will be followed up on, I can assure you, in our future planning if we get our laws.

Dr. LENTZ. Thank you, Mr. Chairman. I am very pleased to have had the opportunity to be here today.

Dr. MEYER. Thank you for coming.

Dr. MEYER. At this point I would like to ask if Mr. Lewis Goldshore is still present. Dr. Goldshore represents the special assistant to the commissioner of the New Jersey Department of Environmental Protection. Do you have copies of your statement?

Mr. GOLDSHORE. Yes, I gave one of your staff about seven or eight copies as I walked in.

Dr. MEYER. Well, all right, sir, let's go ahead without the prepared paper.

**STATEMENT OF LEWIS GOLDSHORE, SPECIAL
ASSISTANT FOR LEGISLATION TO THE COMMISSIONER
OF THE NEW JERSEY DEPARTMENT OF
ENVIRONMENTAL PROTECTION**

Mr. GOLDSHORE. I am Lewis Goldshore, special assistant for legislation to Commissioner Richard J. Sullivan of the New Jersey State Department of Environmental Protection.

New Jersey is pleased to have this opportunity to appear here today to present its views concerning S. 1016, a bill to control the generation and transmission of noise detrimental to the human environment, and for other purposes.

Actually I found out about the hearing yesterday at 4 o'clock, and although I was aware of the pending legislation and able to obtain a copy of it on Monday from the Office of Noise Abatement and Control in New York, most of my comments are directed at the first 17 pages of the bill because that is all I have. I understand also that the bill may have been amended in a subcommittee hearing, and I would like you to bear that in mind in reviewing the comments that I have to make about it. I hope the subcommittee has taken care of all the proposed amendments that I have in my prepared text and in the notes that I wrote on the train coming down this morning.

I also had the opportunity to speak with a representative of the Council of State Governments, and he assured me that the council is in agreement with the substance of the statement concerning the preemption of State authority. That was in S. 1016 as we saw it.

We welcome the entrance of the Federal Government into the field of noise control. I need not describe the damaging effects which noise can have on the environment and the quality of life. In our worker safety laws we have long recognized that noise within a place of employment can adversely affect health and welfare. It is equally apparent that high levels of noise can interfere with wildlife and can be detrimental to the serenity of

our parks and natural areas. Even more serious hazards to man and the environment may be caused by long-term exposure to lower levels of noise which are increasing in the general community.

Since we all recognize the need for such legislation, the focus of my remarks will be on the effectiveness of the proposed bill in controlling noise, particularly with reference to section 6(d), which appears to preempt the adoption of State regulation of certain noise sources.

This section raises some basic and disturbing questions regarding the proper relationship of Federal regulation and enforcement to State activities in the field of environmental protection. Several recent pieces of Federal legislation would preempt State regulation. Among these are the proposed Pesticides Control Act, the Water Pollution Control bill recently passed in the Senate, and S. 1016. It would be helpful to examine the history of environmental control activity before taking this course.

New Jersey has been active in the field of environmental protection since 1954. Perhaps this interest was required by our own special desire to survive. The 1954 air pollution control was the first law of its type in the nation. In its amended form the provisions of that act have been used as a model for other States and Federal legislation.

The essence of New Jersey's environmental protection laws is in their relatively simple approach. Utilizing the air pollution control law as a model again, the issue to be regulated is defined in terms of its undesirable effects and its tendency to cause those effects. This approach serves as a standard for the legislative delegation as well as enabling the responsible agency to regulate to prevent a problem from developing, rather than attempting to correct a problem after the fact. This approach is reflected in Senate bill No. 2069, the Community Noise Control Act, currently pending in the New Jersey Legislature, a copy of which is attached to my printed statement today.

Dr. MEYER. It will appear in the record following your statement.

Mr. GOLDSHORE. Thank you.

New Jersey's environmental protection laws have been vigorously enforced. This policy is exemplified by an action brought against the Nation's major airlines in 1969 for excessive smoke from jet aircraft. The lawsuit was settled only after an agreement was signed by the airlines to retrofit the entire fleet by the end of next year and by the concurrence and active intervention of two Federal departments.

In the air pollution control area, for example, during the first 9 months of 1971 more than 700 cease-and-desist orders were issued and almost \$200,000 in penalties were recovered. It therefore does not appear to be in the public interest to in any way preempt, that is to exclude, a State from jurisdiction to protect its citizens from environmental insults.

The history of Federal in comparison to State regulatory activities should make it very clear that preemption of State regulatory authority works only to the benefit of the polluter. Wherever

this has been the case these were the results. This is true in the motor vehicle air pollution area, and perhaps even in the FAA preemption of State regulation of noise from aircraft.

The Federal Government has neither the manpower, the data base, nor the ability to take over environmental control as a monopoly enterprise directed by the National Government from Washington. Conditions in each State differ, the will of the people for strict environmental control differs, and the means to clean up the air, and the water, and to lessen the din of industrial America differs from State to State.

We therefore believe that it would be a most serious error to pass S. 1016 in its present form. Section 6(d) should be amended to allow for stricter State regulation if the State desires it.

We believe that section 6(d)—and all other Federal environmental legislation for that matter—should reflect what we believe is the proper distribution of labor between the States and the Federal Government in the environmental field.

One of the chief benefits of the Federal system of government, as opposed to a unitary system, is that it allows for regional differences to be reflected in the legal and political framework of those regions, in this case the States. Because of this degree of freedom, different solutions can be tried to solve the pressing social and environmental problems of our day. This is a form of experimentation which has been looked on with favor by the foremost authorities, and from these experiments we can learn to do things in better ways.

The proper relationship then between the States and the Federal Government should thus be as follows:

The Federal Government may adopt legislation which enables national regulation of activities which can have a harmful impact on the environment. The severity of these regulations should, however, serve as nationwide minimums, not as limitations. Thus those States that wished to could adopt more stringent regulations, and enforce them. This pattern is important if New Jersey is to clean up its environment, for nowhere are environmental problems more severe than they are in our State. Our population density is the highest in the Nation, and we have more vehicles per square mile than any other State in the Union. If the Federal Government were the sole regulatory body we would be governed by the same regulations as Wyoming and Colorado, where the environmental problems stemming from dense urbanization are not nearly so severe. Such regulations would be a joke.

It is important, however, for the regulations established by the Federal Government to be applicable nationwide. Thus States governed by thoughtless men who would bend nature to their will, and who view all environmental problems through the distorting prisms of profit would tend to attract needed industry away from States, such as ours, which care about their environment. It is also important for the Federal Government to have its own set of nationally applicable regulations so that it can step into the enforcement area if the State falls down on the job.

I therefore suggest that you consider amending section 6(d) of the bill as follows:

Nothing in this Act or any regulations adopted pursuant to this Act shall impair the authority of any State or subdivision thereof to adopt and enforce standards for the control of noise more stringent or more inclusive than those adopted hereunder. Existing State or local standards for the control of noise more stringent or inclusive than those adopted pursuant to this Act shall not be superseded or otherwise affected by this Act.

I also have a number of comments about S. 1016 in its other provisions besides the preemption or partial preemption that appears in S. 1016, and I must offer that caveat again that it was the first 17 pages of S. 1016 that I had the opportunity to review.

Well, I believe that other amendments would be required in the body of the bill to reflect the change in philosophy of control that I expressed as far as the preemption. So that in the statement of policy, finding, and declaration, this would have to be reflected if section 6(d) was changed.

In section 2(b) I think the language and standard of this act, that the regulations from noise or that the environment for all Americans free from noise that jeopardizes their health or welfare should be changed to "which threatens to jeopardize or jeopardize health or safety."

Further down in section 3(c) the definition of product was somewhat unclear. I think additional language is needed to clarify and sharpen that definition. Whether in fact transportation vehicles includes transportation equipment, transportation machinery, transportation appliances, or any types of equipment, is the point of my comment on section 3(c).

Going down to section 5(a), I recommend that the criteria for noise control need not be limited to public health or welfare, but rather reflect an expanded definition of health and welfare to include environmental effects.

There is question further in 5(a) whether there is a necessity to determine consistency between industrial and community noise control standards, because from what we have been led to understand they could be very different.

In 5(b) I was confused as to what was meant by major sources of noise and whether that was limited to articles passing in commerce.

I know the approach taken in a considerable amount of Federal legislation is called interlocking definitions, and I would think that a more helpful approach might be to define the term in the context of the section and not rely on interlocking definitions.

Going down to 6(a) which authorizes the administrator to adopt standards for the classification of products, the term "ultimate purchaser" is defined in the definitions section but does not appear here. If the Air Pollution Control Quality Act were used as a model I think it would be good to use the term "ultimate purchaser" in this section and not rely on the interlocking definitions again.

In describing the factors that the administrator should take into account before adopting standards he is required by this section to consider in the statute whether the standards are economically reasonable, and while I believe that is a legitimate concern in the adoption of standards, I don't think it should have statutory recognition.

Further there is the necessity of a finding as to whether the particular product can be more effectively controlled by another level of government in adopting the standards. I question why it is not proper to have all three levels control the generation of noise.

Another comment concerning 6(a) starts with the word "provided." It seems to me that it can be construed as a grandfather clause in this subsection and should be more narrowly drawn.

In 6(b) the term "adversely affected persons having the opportunity to file objections and request hearings" is, in my opinion, too narrow, and I believe any interested person should be so empowered.

Further in that section there is a distinction in the rights of a manufacturer as opposed to other persons to request a hearing. I think that provision should be eliminated. It does have an adverse effect on the agency credibility.

6(d) I have already explored in the prepared text.

In section 8, that answers some of the questions that I raised earlier about interlocking definition and the drafting technique. I don't think that the Air Quality Act which appears to have been followed is commonly understood. We have much interpretation. It follows a pattern in Federal legislation that seems to introduce a lot of confusion and a lot of switching back from section to section to get the meaning and intent of the legislation. I don't think that is in the public interest nor a desirable drafting technique.

In section 8(a) (2) I had one comment, and that was that the intention here is clear to regulate owners or operators as well as manufacturers, when the product is actually passed to the ultimate consumer or ultimate purchaser. That wasn't clear from the rest of the bill, and this is why the preemption argument is even stronger. This preemption here appears more drastic than the one taken in the Air Quality Act, and I think is highly undesirable.

Questions that I would raise here are whether the Federal Government should properly set the same standards for noise from diesel trucks which would be applicable in New Jersey as would be in North Dakota, and I think not; and that the Federal standards should only serve as a national minimum. I don't believe that as drafted here it would provide adequate protection for the many residents in New Jersey who live, unfortunately, too close to our highways.

Section 8(b) (2) contains a blanket exemption for exports, and I don't believe that is in the public interest.

Section 9(c) provides—well, I guess it is 9(c), I'm sorry—provides a blanket exemption for accessibility of records of foreign manufacturers who sell products in the United States. I think that is overly broad and should be drafted much more narrowly to require that any manufacturer doing business in the United States should be subject to this section.

As far as additional comments, I think there should be some mention of citizen right to bring action. I don't have a particular form in mind, but I think it would be very helpful if the provisions in the Air Quality Act and some of the other acts were

studied and compared to determine whether they could be inserted.

I believe that the necessity of program grants to State and local agencies and intermunicipal agencies has been discussed earlier.

In my version, page 17 was the last page, and perhaps it was included after that. I certainly do recommend it.

That concludes my testimony.

(Senate bill No. 2069, State of New Jersey, follows:)

State of New Jersey

SENATE BILL 2069

INTRODUCED FEBRUARY 11, 1971

AN ACT Concerning the control of community noise levels; empowering the State Department of Environmental Protection to promulgate regulations for such purpose, and making an appropriation

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. This act shall be known and may be cited as the "Community Noise Control Act."

2. The Legislature finds and determines that the people of the State are entitled to and should be insured an environment free from insults which unnecessarily degrade the quality of life; that the levels of noise in the community have reached such a degree as to endanger the health, safety and welfare of the people of this State as well as the integrity of the environment; and that this threat can be abated by the adoption and enforcement of stringent community noise standards embodied in regulations.

3. The following words shall have the following meanings:

(a) "Department" means the State Department of Environmental Protection.

(b) "Commissioner" means the Commissioner of the Department of Environmental Protection.

(c) "Community noise" means any sounds of such level and duration as to be or tend to be injurious to human health or welfare, or which would unreasonably interfere with the enjoyment of life or property throughout the State or in any portions thereof, but excludes all aspects of the employer-employee relationship concerning health and safety hazards within the confines of a place of employment.

(d) "Person" means and shall include corporations, companies, associations, societies, firms, partnerships, and joint stock companies as well as individuals, and shall also include all political subdivisions of this State or any agencies or instrumentalities thereof.

4. The department shall have the power to formulate and promulgate, amend and repeal rules and regulations preventing, controlling and prohibiting community noise.

5. No rule or regulation, and no amendment or repeal thereof, except as to emergent matters presenting imminent peril to the public health, safety or welfare, shall be adopted except after public notice of the date, time and place of such hearing as required under the Administrative Procedure Act (C. 52:14B-1 et seq.), and except as provided in section 7 of this act. At such hearing opportunity to be heard by the department with respect to the proposed regulation shall be given to the public, except as to emergent matters presenting imminent peril to the public health, safety or welfare.

6. The department, after consultation with the Director of the Division of Motor Vehicles, shall have the power to formulate and promulgate, amend and repeal codes, rules and regulations establishing standards and requirements for the control of noise from motor vehicles.

7. Any code, rule or regulation establishing standards and requirements for the control of noise from motor vehicles shall be applicable to such classification of motor vehicles as the department shall determine to be necessary to carry out the purpose of this act and shall apply to such motor vehicles not earlier than 180 days following the date of adoption.

8. Any motor vehicle which is subject to inspection by the Division of Motor Vehicles or any other duly authorized body shall, as a condition of

compliance with said inspection, pass such tests as may be required to demonstrate that the motor vehicle complies with any standards and requirements for the control of noise established by the New Jersey State Department of Environmental Protection which are applicable to such motor vehicle.

9. Any person who operate a motor vehicle or owns a motor vehicle which he permits to be operated upon the public highways of this State which generates noise in excess of standards adopted by the department shall be liable to a penalty of not less than \$25.00 nor more than \$1,000.00 which shall be enforced in accordance with the provisions of chapter 5 of Title 39 of the Revised Statutes.

10. The department shall control community noise in accordance with the provisions of any applicable code, rule or regulation promulgated by the department and for this purpose shall have power to:

(a) Conduct and supervise research programs for the purpose of determining the causes, effects and hazards of community noise;

(b) Conduct and supervise State-wide programs of noise control education including the preparation and distribution of information relating to noise control;

(c) Require the annual registration of persons engaged in operations which may generate community noise and the filing of reports by them containing such information as the department may prescribe relating to their operations and pertinent to the generation of community noise. Such registration may be revoked or suspended or renewal withheld, for any violation of this act or of any codes, rules, regulations or orders promulgated hereunder.

The department may in accordance with a fee schedule adopted as a rule or regulation establish and charge non-refundable fees for registration which may be annual or periodic as the department shall determine. The registration fee shall not be less than \$10.00 nor more than \$250.00 based on criteria contained in the fee schedule.

(d) Enter and inspect any building or place except private residences for the purpose of investigating an actual or suspected source of community noise and ascertaining compliance or noncompliance with any code, rule, regulation or order of the department. Any information relating to secret processes or methods of manufacture or production obtained in the course of such inspection, investigation or determination, shall be kept confidential and shall not be admissible as evidence in any court or in any other proceeding except before the department as herein defined.

(e) Receive or initiate complaints of community noise, hold hearings in connection herewith and institute legal proceedings for the prevention of community noise and for the recovery of penalties, in accordance with this act;

(f) With the approval of the Governor, cooperate with, and receive money from, the Federal Government, the State Government, or any county or municipal government or from private sources for the study and control of community noise.

11. No person shall obstruct, hinder or delay, or interfere with by force or otherwise, the performance by the department or its personnel of any duty under the provisions of this act, or refuse to permit such personnel to perform their duties by refusing them, upon proper identification or presentation of a written order of the department, entrance to any premises at reasonable hours.

12. Whenever the department has cause to believe that any person is violating any code, rule or regulation promulgated by the department, the department shall cause a prompt investigation to be made in connection therewith.

If upon inspection the department discovers a condition which is in violation of the provisions of this act, or any code, rule, regulation or order promulgated pursuant thereto, it may issue an order to cease and to take such steps necessary to enforce such an order. The said order shall describe the nature of the violation and shall provide a reasonable specified time within which the violation must cease.

The person responsible shall make the corrections necessary to comply with the requirements of this act or code, rule, regulation or order promulgated pursuant thereto within the time specified in the order.

Nothing herein shall be deemed to prevent the department from prosecuting any violation of this act, or any code, rule, regulation or order promulgated pursuant thereto notwithstanding that such violation is corrected in accordance with this order. The department shall not be prevented from directly prosecuting any violations of this act or any code, rule, regulation or order promulgated pursuant thereto, without the necessity of first issuing an order.

13. Any person aggrieved by an order of the department under this act may, upon application made within 15 days after notice thereof, be entitled to a hearing before the department which shall within 30 days thereafter hold a hearing of which at least 15 days written notice shall be given to such persons. Within 30 days after such hearing the department shall issue an appropriate order modifying, approving or disapproving its order. A copy of such order shall be served upon all interested parties. Pending the determination by the department and upon application therefor the department may stay the operation of such order upon such terms and conditions as it may deem proper.

14. The testimony taken at any hearing shall be under oath and recorded stenographically, but the parties shall not be bound by the strict rules of evidence prevailing in the courts of law and equity. True copies of any transcript and of any other record made of or at such hearing shall be furnished to any party thereto upon request and at his expense.

15. Any hearing required by this act to be held before the department shall be held before the commissioner or a member of the department designated by him, who shall have power to subpoena witnesses and compel their attendance, administer oaths and require the production for examination of any books or papers relating to any matter under investigation in any such hearing. The department, at the request of any respondent to a complaint made by it, or to it, pursuant to this act, shall subpoena and compel the attendance of such witnesses as the respondent may designate and require the production for examination of any books or papers relating to any matter under investigation in any such hearing.

16. If any person violates any of the provisions of this act or any rule, regulation or order promulgated pursuant to the provisions of this act, the department may institute a civil action in a court of competent jurisdiction for injunctive relief to prohibit and prevent such violation or violations and the said court may proceed in the action in a summary manner.

Any person who violates the provisions of this act or any rule, regulation or order promulgated pursuant to this act shall be liable to a penalty of not more than \$3,000.00 for each offense, to be collected in a summary proceeding under the Penalty Enforcement Law (N. J. S. 2A:58-1 et seq.), and in any case before a court of competent jurisdiction wherein injunctive relief has been requested, except as provided in section 9 of this act. The Superior Court, County Court and County District Court shall have jurisdiction to enforce said Penalty Enforcement Law. If the violation is of a continuing nature, each day during which it continues shall constitute an additional, separate and distinct offense. The department is hereby authorized and empowered to comprise and settle any claim for a penalty under this section in such amount in the discretion of the department as may appear appropriate and equitable under all of the circumstances, including a rebate of any such penalty paid to the extent of 75% thereof where such person satisfies the department within 1 year of such other period as the department may deem reasonable that such violation has been eliminated or removed or that such order or injunction has been met or satisfied, as the case may be.

17. The powers, duties and functions vested in State Government under the provisions of this act shall not be construed to limit in any manner the powers, duties and functions vested therein or in any person under any other provisions of law or any civil or criminal remedies now or hereafter available to any person related to community noise control.

18. No existing civil or criminal remedy now or hereafter available to any person shall be superseded by this act or any code, rules, regulations or orders promulgated pursuant thereto.

No ordinances or resolutions of any governing body of a municipality or county or board of health which establish specific standards for the level or duration of community noise more stringent than this act or any code, rules, regulations or orders promulgated pursuant thereto shall be superseded. Nothing in this act or in any code, rules, regulations or orders promulgated pursuant thereto shall preclude the right of any governing body of a

municipality or county or board of health, subject to the approval of the department, to adopt ordinances, resolutions or regulations which establish specific standards for the level or duration of community noise more stringent than this act or any code, rules or regulations promulgated pursuant thereto.

19. This act shall be liberally construed to effectuate the purpose and intent thereof.

20. If any provision of this act or the application thereof to any person or circumstances is held invalid, the remainder of the act and the application of such provision to persons or circumstances other than those to which it is held invalid, shall not be affected thereby.

21. There is hereby appropriated for the purpose of this act the sum of \$75,000.00 for the fiscal year of 1970-1971.

22. This act shall take effect immediately.

STATEMENT

The quality and enjoyment of life in New Jersey has unnecessarily been interfered with by the rising levels of community noise. The "Community Noise Control Act" enables the Department of Environmental Protection to promulgate regulations controlling the level and or duration of this environmental insult. The act is intended to supplement the existing authority and remedies available to abate noise conditions.

Dr. MEYER. Fine. Let me thank you very much for presenting the views which your State and which the Council of State Governments have regarding this particular pending legislation. And let me say that many of the administration's views and positions regarding these issues that you have raised are rather succinctly stated in the transcript of the hearings before the Subcommittee on Public Health and Environment of the House Committee on Interstate and Foreign Commerce, known as noise control, which has been published by that committee and is available.

Let me address myself to this question of preemption a moment, if I might. Some of the other panel members will probably want to ask questions about it also.

Let me hypothesize a case for you and see what your reaction to it is from New Jersey's viewpoint. Let's assume that the Congress in its wisdom decided to establish Federal regulations as minimum standards and gave carte blanche to the States to establish more stringent type standard as they saw fit. Now let me paint a situation for you and get your reaction to it.

I do believe that most of the freight moving to the Port of Newark moves by truck, and a fair percentage of it moves in interstate commerce. Not all the trucks come from within the State of New Jersey. Some of them come from manufacturing plants in Connecticut, Massachusetts, New York, Pennsylvania, et cetera. I also believe that New York operates a fairly large size shipping center, a major port. Now suppose the State of New Jersey enacted very, very stringent decibel truck rules and regulations which were different from those of the State of New York. What impact do you think that would have on the flow of traffic between the two ports?

MR. GOLDSHORE. I don't think it would have any impact at all. I think if the regulations were adopted by the State and were reasonable, were enforceable, and did not constitute an unreasonable restraint on interstate commerce, they would be sustained.

We have the same question with air pollution generated by diesel trucks right now, smog. The State of New Jersey was one

of the first to adopt a very stringent code. I haven't seen a reduction in traffic on the New Jersey Turnpike as a result of it. The regulation if challenged I am sure will be sustained, will be found not to be an unreasonable restriction on interstate commerce.

Dr. MEYER. Well, let me carry this a step further. Suppose, though, that your regulation is of such a nature that a truck moving from Pennsylvania to Newark can't meet the standard. What do you propose to do, have an interchange point at the end of the New Jersey Turnpike where all the trailers are dropped off and picked up by tractors that meet your standards?

Mr. GOLDSHORE. There have been a series of cases, some before the Supreme Court, on safety precautions required on trucks, driving safety requirements imposed by the various States concerning trucks, and I think the standard is whether the regulation is a reasonable exercise of the State's police power. If it is such, it shall be applicable and is capable of being enforced not only against trucks originating within the State, but trucks passing through the State.

So I think the test will be whether the regulation is a reasonable test. If it is a reasonable test it passes the requirement of due process and equal protection; if it passes those tests then it will be applicable and shall be capable of being enforced against both trucks or vehicles originating in the State passing between two points within the State and those that pass in interstate commerce.

The regulations that have been stricken or overruled by the courts, by the judiciary, have been ones that were unreasonable even within the State.

Dr. MEYER. Well, let's carry this a step further then, if we might, because it is an interesting and important issue. Let's say the city of New York under authority granted it by the State of New York enacts much stricter standards than the State of New Jersey. How is the State of New Jersey going to feel about its trucks not being able to cross the river into New York?

Mr. GOLDSHORE. If the regulations adopted by New York were reasonable—that is, if they were so restrictive as to be unreasonable, to constitute a denial of due process, that would be one question. If the regulations in New York were more stringent but were reasonable, that is a difficult test sometimes. But I think the first States to get into this area will set national standards. That has been true in air pollution, and I think it is going to be true in noise control as well.

If in fact the New York standards were more restrictive and were reasonable, then there would be no reason why New Jersey vehicles shouldn't be able to comply, and should be obligated to comply with that law. We have that situation now. We have the possibility of that situation now, and you don't see it happening. So I don't see the justification for the Federal Government to exclude jurisdictions that are concerned with the environmental problems from regulating those problems.

Dr. MEYER. OK, let's carry this even another step further. New Jersey has a large New Jersey-based trucking firm and it operates into the State of Wyoming where you are fearful that its

regulations will not be strong. The testimony we have heard from the Western States says they are more fearful that the crowded States, such as yours, which are heavily industrialized will be more inclined to give in to industry and not have rigid enough and strong enough provisions. They also indicate that they have peace and quiet and they intend to preserve it. How would you feel if they came up with extremely tight rules, and said that while your standards might be adequate to protect the people that live near a freeway they would not protect people that live in rural or wildlife areas, and they simply said you can't operate your truck here?

Mr. GOLDSHORE. Well, I think it would work to the advantage of the New Jersey environment as it would in Wyoming. If Wyoming was to choose to adopt more stringent standards that were in fact capable of being enforced, they would have to meet the same judicial test that we referred to earlier, and if that was the case I think New Jersey vehicles would have to meet those tests.

Dr. MEYER. I will yield to first Dr. Dietrich on the extreme left.

Mr. DIETRICH. Well, I have heard a lot of discussion about the difficulties that might arise if indeed every local jurisdiction or State were to try and outdo its neighbor with respect to the stringency of the standards. But I wonder whether or not there aren't internal balancing factors that you might anticipate of the kinds that were just mentioned by our chairman, the need for not affecting seriously the economy of the State, that would not provide within each State good reason to believe that a sensible balance should be struck.

Mr. GOLDSHORE. Exactly. I think there is a limitation on how stringent you can be, and with those limitations contained in the cases dealing with due process and unreasonable restriction on interstate commerce, those principles. I haven't seen the States jumping to outdo each other in the field of air pollution in terms of emission standards. It just hasn't been the case. That is in the adoption of overly restrictive standards that have been stricken by the courts. We find that some jurisdictions are stricter than others probably because of these balancing factors, and I think that the history justifies establishing national minimums but allowing the States, if they so see fit, to adopt standards more restrictive.

The only group that preemption works to the advantage of is those people who are about to do environment degradation.

Mr. DIETRICH. Well, I had one additional question which has to do with the interest I think we all have in experience that others have had in the problem of regulation of the environment. You spoke about a New Jersey regulation, I believe it is in force or upcoming, with respect to motor vehicle air pollution, smog, as well as, I understand, one having to do with other exhaust pollutants. And I have heard—and this is just from the news media—that New Jersey predicts a sizeable fraction of the vehicles on its roads—I assume by that it means New Jersey licensed vehicles—will be unable to meet the initial requirements, and the fraction I recall is something in the order of a quarter to a third.

If I am right with those numbers, would not a similar regulation with respect to noise—would you foresee noise with those, and would you foresee difficulties with similar regulations with respect to noise just by the fact that overnight it creates a tremendous burden on those vehicles that do not comply and probably a considerable administrative effort on the part of the authorities in New Jersey?

Mr. GOLDSHORE. Well, to answer or respond to the second part of your question first, the State is involved in a passenger motor vehicle program, air pollution control program. Regulations have been proposed concerning contaminants from motor vehicles, and if adopted as proposed would require a sizable or substantial number of cars to be tuned up, to be properly functioned, and this would probably require just an annual tuneup in most cases.

As far as the diesel code that has been adopted, that is in force and has been enforced by the State police in the division of motor vehicles, and has been enforced against both trucks licensed and registered in New Jersey and trucks from without the State.

Mr. DIETRICH. Well, is it in your opinion a reasonable thing to do to have the initial regulation set so that such a large fraction of the vehicles would be expected to be found in violation? Would you think the State of New Jersey should consider a regulatory limit for motor vehicles in use, trucks, buses, motorcycles, that might find a third or so of the vehicles presently on its highways in violation?

Mr. GOLDSHORE. Well, before that regulation will be adopted considerations like this will be given to the number of vehicles which will fail the first inspection. These considerations have entered into the drafting of the code. We believe that the percentage that will fail during the first test will be able to pass after the normal tuneup-type of operation, and that is not an unreasonable burden to place on the motorists driving a car in New Jersey. The projections are that that normal tuneup will prevent a large amount of air pollution from entering the atmosphere.

Mr. DIETRICH. Well, to bring this back to noise, would you then say that if a similar study were to show that tightening up or replacement of rusted mufflers would be all that was required with respect to a proposed noise regulation that you would consider that as one of the more reasonable requirements, but you would not consider necessarily redesign or retrofit components to the vehicle in the same light?

Mr. GOLDSHORE. Well, I think it is kind of hard at this time to say what we would consider in the noise area. There are several possibilities, and none of those possibilities should be ruled out at this time. One is performance standards, and the other is requirement acquirement. And after study, either one or both of those might be deemed necessary and reasonable in this area, noise control.

Mr. DIETRICH. Thank you.

Mr. MARTIN. Of course, the word reasonable is used consistently by many people. Some of the statements sort of refer to the EPA would not be reasonable, they would be too lax in setting their standards, and therefore each State with its own wisdom would be more reasonable in taking care of its own needs. Short of

legal action, who will judge who is reasonable on restrictive standards?

Mr. GOLDSHORE. I am not sure I know exactly what you mean. What we are suggesting here is that if the Federal Government is to get involved in the area of noise control it should set minimum standards and allow the States, the various States and local governments to adopt standards more restrictive than those contained in the Federal regulations.

The history of the Federal air pollution control program as compared to the most vigorous of the State programs if an example of what happens when the Federal Government works under a very complex statute that does not permit easy enforcement when the Federal Government is too far from the problem, too far from the source. It just, in my mind, is of no value to preempt local more stringent requirements, and when I say local I mean State and municipal.

Mr. MARTIN. Unlike other types of legislation, the aircraft one specifically, which pretty much precludes operational action of local communities, 1016 gives local communities complete freedom in operational restrictions. Why is that not enough to really control whatever additional restrictions you wish over and above what would be a national standard?

Mr. GOLDSHORE. I am not sure that 1016, as I read it, would allow States to adopt more stringent use requirements.

Mr. MARTIN. It gives you complete freedom on use requirements.

Mr. GOLDSHORE. Looking at 1016, at this point it isn't clear to me that that is the intention.

Dr. MEYER. Well, I can assure you it is the intent.

Mr. GOLDSHORE. Well, I think the problem in drafting is that these things must be made perfectly clear. Preemption is something that the courts have had a lot of trouble with in a lot of areas, and not only the Federal courts in, let's say, the area of the FAA regulations, but State courts as well. And I think it would be in the interest of the panel to recommend that that be very clear, very clear that use regulations more stringent than the Federal legislation are not intended to be preemptive. A statute which is silent on such a provision—and as I said, I had the first 17 pages—on page 10 there is a partial preemption, and there is a question as to whether the partial preemption might include more than what is intended. If it wasn't intended to preempt State regulations which are more stringent than the Federal regulations I think it should be manifest, should be very clear.

Mr. MARTIN. I think it is. Let me read you the sentence, and this pertains to use, and it says "nothing in this section shall diminish or enhance the rights of any State or subdivision thereof otherwise to control, regulate or restrict the use, operation or movement of such products." The only thing that preemption attacks or takes away from the local community is the right of setting manufacturer standards, new vehicle type standards.

Doesn't this give you on the basis you now have complete freedom to restrict any vehicle operation in your State, exclude

them from your State if you so desire, if they are too noisy, more than enough control over a vehicle built to national standards?

Mr. GOLDSHORE. Well, as I said, I hadn't had the full opportunity to review the legislation. At first reading, section 6(a) could include more than manufacturer standards. If that isn't the intent I think it should be clear. I think the problem that has developed is through the use of the interlocking definitions.

To respond directly to your question, if it is clear that use standards—once a vehicle or product passes to the ultimate purchaser that States can adopt standards more stringent than the Federal standards, I think that is one part of it, and if that is clear from the bill—what I am suggesting is that it can be made more clear in the bill.

Now the second part of the answer is whether the Federal Government should preempt the regulation of manufacturers, and I think not.

Mr. MARTIN. Let me delve on that. Do you feel that the EPA will not select what is a reasonably stringent requirement to protect the overall public?

Mr. GOLDSHORE. I don't think that is what I am suggesting. What I am suggesting is that it does not serve the public interest in this area to preempt in any way. I have confidence that the EPA will adopt standards that will give manufacturers a reasonable time to comply, and there will be some question throughout the country as to what a reasonable time is. There will be questions about whether the Federal standards are reasonable or stringent enough. Those are the questions about the motor vehicle standards and are recognized in the Air Quality Act exemption from California motor vehicle air pollution standards.

So what I am suggesting is that there is good reason to extend the provision providing that the Federal Government shall not preempt to the regulation of manufacturers.

Mr. MARTIN. People use this California exemption in the Air Quality Act somewhat loosely because they have a very special and unique situation in California.

Mr. GOLDSHORE. We have the same problems in New Jersey, and we have noted the concentration of ozone in our atmosphere, we have noted photochemical smog. At one time that was thought to be correct and it is no longer the case. We have levels that approach Los Angeles levels in certain portions of metropolitan New York-New Jersey.

Mr. MARTIN. Do you feel there are special situations in the area of noise equivalent to those special situations that arise in air pollution?

Mr. GOLDSHORE. Yes.

Mr. MARTIN. Such as?

Mr. GOLDSHORE. There are areas in New Jersey where homes are very close to areas of employment, homes are very close to highways, residences are close to areas of continuous noise, and I think that poses special problems that we don't see in other areas.

Dr. MEYER. Well, if the Chair might intrude here, I am not aware of all the details, but we had a very graphic presentation by the California Department of Highways on the first day of this

hearing showing their admitted horror story—in fact they even used that definition—of houses built right up against freeways, and indeed the fact that the State was investing large sums of money now in barrier walls for control of noise. We have heard similar testimony in virtually every major metropolitan area, and I think if I might sort of bring this dialog into a little sharper focus and move on with it, I think the fear that has been expressed by many representatives such as yourself really boils down to the following reasonable and understandable apprehension: (a) the Federal Government won't be strong enough; (b) that it is going to take too long to get anything done; (c) that whatever is done won't be very easily enforced.

These questions have been addressed a number of times. As I said, Mr. Goldshore addressed them in his testimony. I don't propose to have a debate with you about this at this point. There are some essential differences I think between the noise problem and the air pollution problem which ought to be noted, though, at this point.

One, a stream of traffic of x number of vehicles of certain horsepower moving at certain speed over a certain type of road surface will produce the same noise condition in California as it does in New Jersey. And furthermore, if you reduce the noise level from the individual sources the aggregate noise level will be reduced promptly and immediately whether it is in California or New Jersey, or whether it is in Wyoming.

The question is then what is the appropriate level to reduce the noise to. It is not like the question of so many vehicles per square mile emitting nitrogen oxide which remain in the atmosphere; the minute you stop the noise source you have reduced the noise. There is not a residual effect or cumulative effect. It is only there while the source is operating. It presents a completely different problem and a completely different set of circumstances when it comes to regulation, and I think that one needs to keep that in mind.

That was one of the reasons that the Congress in its wisdom and the administration in its judgment has proposed that these standards be based upon a careful assessment of the health and welfare effects. And I might add for your general review that welfare as used here includes environmental impact.

Mr. GOLDSHORE. I think if that is the intent it should be listed.

Dr. MEYER. Well, let me add this, sir, and again not to get in debate. In all of the environmental legislation the welfare term is as defined—Congress has accepted this now—in the Clean Air Act, and welfare includes everything. So I think the point I am making is yes, I can understand your apprehensions about this. But the point that has to be kept in mind is that the Federal legislation proposes very strict fines for violation, up to \$25,000 for each violation and each day constituting a separate violation. No testimony presented to us to date indicates that any State legislature is contemplating any such fines. In fact, in California, if I am not mistaken, the fine is \$500.

Now the proposed legislation in its wisdom also proposes that an enforcement arrangement be structured between the Federal

Government and the States so that, as in the case of the Occupational Safety and Health Act, enforcement may be transferred to the States. It is then that the States will derive 50 percent of any of the fines levied. This seems to us to represent, at least from the Federal level, an indication of the seriousness with which we view the problem and also adds to it, shall we say, much more emphasis as to the consequences of failing to meet the standards.

While I would agree with you that there may be some circumstances in which more restrictive use operations and more restrictive conditions are needed, I doubt very seriously from what we have seen and from the evaluation of all the legislation that has been passed on this subject dealing with misdemeanors and nuisances, et cetera, that any State is going to come up with a \$25,000 fine for running a motorcycle down the highway if that motorcycle doesn't have the right kind of muffler on it. I am just not convinced that that is going to be the case; but maybe it will be.

Mr. GOLDSHORE. As a control agency official in the environmental field for the last 3 years, and as an attorney, I feel that the viability of a program should not be based on the amount of fine or the amount of penalty that may be levied, but rather a commitment to the objective of protecting the environment. And I submit to you and to this panel that you will only serve the interests of the noisemakers if you in any way, shape, or form preempt State or local jurisdictions in this area.

Dr. MEYER. Well, there's honest differences of opinion on this subject and we recognize that.

Mr. Mayor, do you have any questions?

Mr. WISE. Just very briefly. I am on the steering committee of the Environmental Quality Committee of the National League of Cities, which is the National Conference of Mayors, Councilmen and Aldermen, Commissioners, et cetera, across the country, and the staff assistant to that steering committee has handed me this note which I believe puts it very well. Let me just read it.

There is some talk in Congressional committees to allow a dual standard to be established for Senate bill 1016 by EPA rather than full nonpreemption or full preemption. One standard would be for urban areas and more strict than a standard for, say, for example, rural areas, assuming that a minimum would be in effect. The National League of Cities and the U.S. Conference of Mayors, which are interlocked and interactive, has proposed to the Senate Subcommittee on the Environment that while preferring no preemption, in recognition of many of the problems involved with interstate commerce, such a dual standard which would be highly severe, low but adequate would be acceptable if such higher standard would be granted by the Administrator of EPA unless he has a compelling reason to deny the request by a city.

Senate bill 1016 would only apply to new goods. Cities would have full powers on old equipment and goods. Cities would also be able to restrict the use of a noisy product; say a truck that can't go to a particular class of street after 6 p.m., for example. They could not prevent it outright, however, but could propose such control and restrictions as to effectively ban it.

This is the steering committee's interpretation, is it?

VOICE. No, this is the Environment Subcommittee of the Commerce Subcommittee.

Dr. MEYER. Of course, there is another approach to this which some people have proposed, too, and which I view with a considerable degree of interest which is along that line. That ap-

proach is that upon petition, as this indicates, a State or city justifying its need could indeed set more strict standards. There are all sorts of possible ways of getting at this approach. This is one, and the one I have just mentioned is another one.

Mr. GOLDSHORE. I think another possible approach is similar to the language we suggested, and that is no preemption whatsoever.

Mr. ELDRED. Seems to me there is a fairly dangerous approach with respect to manufacturing standards. As I understand the economics of the situation, one of the reasons this country is in the strongest economic position in the world is because it has the largest marketplace in the world. This has been a major motivation for the nations to come together in a common market, and they are now getting their regulations uniform throughout so that they can sell goods freely from one country to another, like OECD is working on noise regulations for all the Common Market countries.

Now if one fractionates by a series of entities within the country to make different manufacturing source standards then we begin to lose strength of this large uniform marketplace.

What seems to be happening in some of the noise regulation where States and even municipalities are deciding how much noise a product can make to be sold within a State or municipality is the name of the game is to outdo the last fellow who made a rule so that each one is more stringent or you have to get to the same point a couple years earlier in time.

This presents the manufacturers with a horrible dilemma. It is all right if one or two States do that and it stays that way and you have effectively the same thing at the national level. But if each of the 50 States and some of the cities start to go their own way the manufacturers are completely at a loss to find out what they have to really respond to in the public interest unless they are going to make special products to sell each of the various States and municipalities.

Mr. GOLDSHORE. Well, if they comply with the most restrictive then they will comply with all of them.

Dr. MEYER. Well, if I might comment on that, though, how a review I have had handed to me recently by one manufacturers are you going to know which one is the most restrictive? I mean group shows 27 different States each one with different legislation and each one of them with vast differences between them.

There are some 220 standard statistical metropolitan areas in the United States. I think the last figure I saw, indicated that there are some 600 cities of over 100,000 population in the United States. I think one has to keep in mind the thing that Mr. Eldred has just said, that obviously at some point because of the facts of life of what you are dealing with you are going to start to arrive at some sort of uniformity across the board. But if you are going to arrive at uniformity across the board by a process of evolution maybe it would be better to try to evolve a uniform standard to start with. But I can see your point, and I am completely appreciative of your concern.

Mr. Berland.

Mr. BERLAND. I like Mr. Goldshore's action orientation, although I don't agree with him at all. In your formal statement you said New Jersey's environment protection laws were rigorously enforced, and you said the policy was exemplified by a suit you brought against the airlines for excessive smoke, and as a result of that the airlines retrofitted their entire fleet so they would be smokeless and with the concurrence of two Federal agencies. That is the first time I heard that. I wonder if you are also going to go the next step and then sue the airlines for noise.

Mr. GOLDSHORE. Just to clarify what this action was all about, in the eventual concept the stipulation that was entered into with the airlines in the New Jersey action with the Department of Transportation and HEW and the airlines and Federal conference, the airlines have agreed to retrofit the entire fleet of jet aircraft powered by the JTA engines and similar engines to produce virtually smoke-free exhaust by the end of 1972. And that is the essence of that action.

A very disturbing piece of legislation was passed subsequently concerning the preemption by the Federal Government concerning noise control. Where we have looked into it we certainly have noise problems generated by the major airport in New Jersey, and there is this question that has been placed over the entire issue by the FAA's possibility of regulation in this area.

Mr. BERLAND. We have heard about that. I think you ought to clarify—several times you used the statement "national minimums," and I think when you get to noise it gets sort of foggy. I think what you really mean is minimum amount of restriction, not minimum noise.

Mr. GOLDSHORE. No, that's right. A regulation proposing lowest common denominator standards that have to be observed nationwide with the opportunity for the States to adopt more stringent requirements.

Mr. BERLAND. You mention the opportunity for citizens to bring action, and I wonder if you were thinking of something along the lines of the noise abatement law in Great Britain where any two residents can go to a local magistrate and bring action against a noisemaker. This is the sort of action you were thinking of?

Mr. GOLDSHORE. Well, I wanted to indicate that I thought some principle or citizens' standard to bring suits for the violation of the standards adopted by EPA or other agencies should be included in any measure. As to the particular provision you are talking about, I am not familiar with it. But I am familiar with other citizens' rights to bring environmental suits. There is a Michigan law which has been adopted in a number of other jurisdictions which would serve as an adequate model. Perhaps if that was thought to be too much of a burden on the Agency a modified approach to that Michigan standard could be included.

Dr. MEYER. Perhaps I ought to interject that both the House and Senate subcommittees are recommending, and the EPA is agreeing, that there should be citizen suit provisions in this legislation comparable to that in the Clean Air Act; but it has

also been broadened a little bit to allow citizen suits, where the State has been delegated by an agreement to undertake enforcement, against the Governor or the head of the environmental agency of that State or whoever is charged with enforcement if he doesn't act.

Mr. BERLAND. This bill we have here, Senate bill 2069, State of New Jersey, that was passed?

Mr. GOLDSHORE. No, that is currently pending in the New Jersey Legislature.

Dr. MEYER. Dr. Johnson.

Dr. JOHNSON. Mr. Goldshore, I would certainly agree with you that New Jersey has its share of very difficult problems, and probably about as many as any State can list. They may vary in quantity from State to State. And I would also agree that New Jersey has been a first among many regulatory actions required to improve the situation. But also I would observe that they haven't always been right in these; and the limitations on the motor vehicle operation, of course, is one of the ways that New Jersey first became famous all the way to the west coast and resulted in many jokes such as: "Well, police cars won't go more than 55 miles an hour, that's the reason the turnpikes have to be limited to that." But on the other hand, they have been right in many ways, and I would hope that they would be right with regard to noise legislation.

And so I would simply wish to emphasize a comment made by our chairman, that the temporal cumulative effects of noise cannot be treated in the same manner as was some of the other air pollutants. And so I would like to hope that New Jersey will include this factor in their consideration of noise legislation. And as a matter of fact, in the area of noise we normally refer to such cumulation as reverberation time measured in arbitrary areas in milliseconds and outdoors in seconds, which is quite different than the hours or months or days that are important in some of the other air pollutants. And so this must be taken into consideration when you try to evaluate your special needs versus those of other States. And I think that upon a study of this that you will find that indeed there may be different criteria and indeed there may be reasons in the area of noise in which you would say well, perhaps there is not as great a need for differences between New Jersey and other States as there are in some other fields.

Now my question here is simply whether or not you would agree with the philosophy which I have set forth.

Mr. GOLDSHORE. But there are differences in the technology and in the problem, in the essence of the problem. But I am more impressed by the commonalities of noise pollution as just another form of pollution that requires vigorous, close to the scene enforcement and regulation.

Dr. JOHNSON. I think that right along all people have recognized there are special local requirements that need to be taken into consideration, and I think that is what a lot of the debate has been about this morning; and I believe that it is the intent of the national code to permit enforcement of special local needs and the setting of special local needs. But in view of

your answer I would like to encourage you to include some people that are qualified in the noise area in making standards or even in making claims or judgments about the desirability for universality in law codes or standards.

Thank you.

Dr. MEYER. There being no further questions at this point, then it is 20 minutes to 1, we will recess 1 hour, until 20 minutes to 2.

Thank you very much, sir, for provoking a very stimulating dialog.

We will meet promptly at 20 minutes to 2.

(Whereupon, at 12:40 p.m., the hearing recessed, to reconvene at 1:40 p.m.)

AFTERNOON SESSION

Dr. MEYER. All right, we will now reconvene after our luncheon recess, and I would like to inquire whether Mr. Gilbert Sones, representative of the Conference of State Sanitary Engineers is here. He called and said he might not be able to make it. If not, then I shall ask Mr. David Scott.

Mr. SCOTT. Thank you, Dr. Meyer.

Dr. MEYER. All right, Dave, nice to have you with us.

STATEMENT OF DAVID H. SCOTT, DIRECTOR, DIVISION OF PLANNING, FLORIDA DEPARTMENT OF POLLUTION CONTROL

Mr. SCOTT. Mr. Chairman, distinguished panelists, and fellow speakers: Thank you for the opportunity to participate in this set of public hearings, and to present our views and activity status concerning noise abatement.

The last session of the Florida Legislature added section 403.061(13) to chapter 403, Florida statutes. This section amended the definition of "pollution" so as to include noise—in quantities which are or may be potentially harmful or injurious to human health or welfare, animal or plant life, or property, or unreasonably interfere with the enjoyment of life or property, including outdoor recreation.

Legislature directed that the department shall have the power and duty to control and prohibit pollution—in accordance with the law and rules and regulations adopted and promulgated by it, and, specifically, to establish standards for the State or for any part thereof, including standards for the abatement of excessive and unnecessary noise and in cooperation with the Department of Transportation establish the maximum decibels of sound permissible from motor vehicles and trucks operating on the highways of Florida. The department is accordingly drafting a proposed rule chapter of the Florida administrative code, to be entitled "Excessive and Unnecessary Noise."

Our first action, upon realizing that "Public Health Engineering" was published by Earl B. Phelps in 1948, and that Hopkins & Schulze published their overview of noise control in "The Practice of Sanitation" in 1954, was to ask some 130 Federal,

State, and municipal governments for copies of their present noise control statutes, rules, regulations, ordinances and codes. We have received responses from perhaps half of those to date. The responses ranged from the typical, "nonexisting or authorized," through narrative statements addressing themselves to barking dogs, public-speaking systems, and general nuisance noises, to a few highly technical codes and ordinances which regulate noise levels to be met by the manufacturers of transportation, agricultural, and recreational vehicles, construction equipment and lawnmowers—both for the present noise levels and for noise levels to be reduced in stages throughout the next several years.

With technical suggestions from sources such as these and your public hearings, and hearings held pursuant to Florida statutes, coupled with the counsel of our legal staff, we expect to promulgate rules for the control of environmental noise which are both current and enforceable. We expect the rule format to include: Scope of rule; definitions; noise level measurement; prohibitive noise levels; exceptions; notice to abate or eliminate excessive and unnecessary noise; noise level standards; specifics; permit applications; and local regulations.

We also expect the rule to cover various land-use zones, such as: Residential, commercial, light industrial, and industrial; with consideration of both sound levels in decibels measured on the A scale and octave-band sound pressure levels as necessary. We expect to use perceived noise levels for ratings applicable to aircraft flying overhead, for instance, and to consider the time of day of noise occurrence as well as the duration of the noise. The evasive factor we must yet solve, however, is the method of enforcement of the proposed noise rule, complex but capable of being solved.

Perhaps it should be noted here that noises related to industrial hygiene remain under the jurisdiction of the Florida Department of Health and Rehabilitative Services' Occupational and Radiological Health Section; while highway noise control, again, will be accomplished jointly with the State department of transportation. The Florida Highway Patrol is the State's enforcement arm in highway matters, and we are seeking in conjunction with the Agency a simple, economical and legally acceptable method of noise measurement, performed either under actual road conditions or through simulation of same.

Although we are considering the technique of measuring vehicle noises at a given distance from a roadway, with the vehicle traveling at a prescribed or predetermined speed, we are also interested in evaluating testing equipment and simulations which could be accomplished during the annual Florida vehicle safety inspection, at the highway patrol motor vehicle inspection stations, such as dynamometer use for speed and stress simulations covering rear tire, drive train, engine mechanical and engine exhaust noise measurements.

Other unnecessary and excessive noises will, we expect, be controlled and enforced through the department's bureau of field services (six regional offices distributed statewide), and the bureau of permitting, surveillance, and enforcement. The depart-

ment already has the duty and responsibility to issue such orders as may be necessary to effectuate control of pollution, and to enforce those orders by any appropriate administrative and judicial proceedings.

The department's regional offices, as well as several recognized county-sponsored local pollution control programs, use a pollution source ticketing procedure which allows a violator of pollution rules to be expeditiously interviewed before local judicial authorities. Despite these enforcement capabilities, much work remains to establish adequate noise monitoring networks and capability, in support of enforcement proceedings.

Aside from enforcement measurements, there is the question of continuing applicability or jurisdiction over certain noise sources. Motor vehicles and aircraft obviously may travel interstate, and uniformity of noise standards among all the States is desirable. It would be too remote to anticipate that national noise standards therefore may preempt some State noise standards, as already has happened with motor vehicle exhaust emissions, waste water discharges from marine vessels, and with the establishment of Federal ambient air quality standards.

We would expect, though, that the standard progression of rule stringency would otherwise still apply, and that the State could promulgate standards more stringent than Federal standards for most sources of excessive or unnecessary noise. We would like to know what Federal standards exist or are proposed before polishing our noise rule. We wish to avoid conflicts between our administrative code and EPA regulations, and desire to maintain close coordination with the Office of Noise Abatement and Control toward establishing uniform and compatible noise regulations.

A major portion of air pollutants in Florida comes from motor vehicle emissions. We are all aware of the relationship of traffic noise as well as NO_x, CO and photochemical oxidants.

It may not be commonly known, however, that while the national average may be two automobiles for every three persons or so, in Florida there are some three motor vehicles for every two persons. Therefore, when we evaluate the motor vehicle emissions as part of Florida's air implementation plan (1970 Clean Air Act), we see almost no means for reducing these "Set II" emission pollutants except through the use of mass transit systems. The Florida Department of Transportation has participated in the preparation of our air implementation plan, to the extent of identifying areas where that department will concentrate on the use of special traffic lanes relegated to use of mass transit systems including, I understand, electric buses. If mass transit should materialize as that department envisions, we should obtain some noise control as well as exhaust emission control benefits.

Mr. Chairman, and panel members, we feel that air, water, or noise standards represent the amount of exploitation of the environment that the affected public is willing to allocate as a trade-off between the polluting activities of people, and the environmental quality desired by that same public. We see the desires of the public expressed in legislative action and in public

hearings. We therefore feel that there must be local input to the development of all pollution control standards.

Public hearings are held in Florida pursuant to chapter 120, Florida statutes, where the views of conservationists and industrialists alike are heard and evaluated before standards are finally qualified and are given the effect of law.

In conclusion, Mr. Chairman and panelists, we are here to gain a better appreciation for the interface between the State and Federal roles in noise abatement, and to better understand how we can work together toward accomplishment of this common goal.

Thank you again for the opportunity to present these viewpoints.

Dr. MEYER. Mr. Scott, thank you very much. This approach is a very constructive one, and before I ask the panelists if they have any questions I want to say that we will certainly look forward to working very closely with the State of Florida, just as we will with other States, as we indicated to the gentleman from New Jersey who preceded you.

I find it rather interesting, though, and I cannot help but use the prerogative of the Chair to observe that although every State seems to think that they have the worst problem you certainly have, at least from these figures presented, comparable problems to those of some of the more populated states. It may be worthy of notation, when one reads that a recreational State as well as a major agricultural and industrial State such as Florida is looking to the use of mass transit to solve some of its mass transit problems it comes as a commentary on the population of the United States.

Against that bit of philosophy I will start on my left. Dr. Dietrich.

Mr. DIETRICH. I have one question that relates to something that you said in your statement, and this is on the bottom of page 4 of your statement. You said that your department's regional offices use a pollution source ticketing procedure that allows a violator of pollution rules to be expeditiously interviewed before local judicial authorities.

I wonder if you would expand and explain just a little bit of what that is, and if indeed you are indicating that that would be something that you might use with respect to noise pollution regulations.

Mr. SCOTT. Yes, sir. Thank you, Dr. Dietrich. I do believe full well that this is something we will use in regard to noise enforcement. We have our regional offices distributed throughout the State for the purpose of being close to the people, the people have pollution control problems; to have engineers and other staff members who understand the local circumstances. Now because these regional personnel are known to the public they are readily accessible to receive complaints and to make investigations. And in the last two quarters of 1970 we had respectively 270 complaints, 330 some odd complaints, and in the first quarter of 1971 the regional offices together had about 370 complaints and in-pollution, incinerators, nuisances of one sort or another that investigations that covered industrial waste, municipal waste, air

the public thought the department could respond to. And upon investigation it is quite possible for a member of the department to write one of these tickets which brings the offender right into the same court, I presume, as if the offender were given a speeding ticket.

Mr. DIETRICH. So it bring right into the lower court—

Mr. SCOTT. Yes, sir. It is much more rapid than the normal administrative procedure of giving a hearing and all these other things that take months.

Mr. DIETRICH. I see. So you do not have a special pollution control hearing board that they are brought before, but rather they are brought right into the local court.

Mr. SCOTT. For the ticketing procedure that is true, sir. We do have recourse, of course, built into our permit rule and built into chapters 120 and 403, Florida statutes, which allows a hearing of an aggrieved party before the board of the department of pollution control.

Mr. DIETRICH. Thank you.

Dr. MEYER. Before Mr. Martin goes on let me ask you a question about this. There has been a lot of discussion—and I noticed you have a comment in here about working with the State highway patrol—about the role of the police department.

Mayor Wise very wisely commented in Dallas, at the hearing held there, that there were a lot of problems about putting some of these responsibilities with law enforcement officials. And I have forgotten as just what hearing it was—maybe one of the panelists who was along may recollect—but this proposal was made that perhaps one of the things that might be done in the noise area was to do something analogous to the thing that has been done with parking meters, using females or other personnel that were highly qualified to develop a checking and enforcement corps.

Could I ask a question, does that sort of thing seem to be a useful adjunct to an enforcement program, not only enforcement program, but an educational program?

Mr. SCOTT. We think so, sir. In this regard, Dr. Meyer, we have in our last budget requested a new series of personnel categories. We call them pollution control technicians and pollution control specialists. These require different degrees of formal education, but they are both used in the response to complaints and in the followup investigations. We have considered even the possibility of placing these persons in uniform so as to get a public relations value from that, or perhaps a little more impact upon the alleged violator whenever a man shows up.

Dr. MEYER. Thank you very much. I yield back to Mr. Martin.

Mr. MARTIN. I have no questions except to compliment you; having worked with the State of Florida in other agencies in their standards role I find they are very probably one of the leading States in this area and should be given credit for this.

Mr. SCOTT. Thank you, Mr. Martin.

Mr. WISE. I would like to pursue the Florida Highway Patrol as your enforcement arm a little more. What is the public's reaction to a ticket for violation of noise? In other words, it is one thing being caught by a radar speed apparatus, but it is

quite another thing being called down for noise, especially where we don't have good evaluation systems as yet. But what is the public citizen reaction to that?

Mr. SCOTT. We, of course, do not have the noise rule established yet, sir. We have not used the ticketing procedure for noise. I fully anticipate it will be used for such.

The impact upon the pollution violator, though, is quite significant. It is the first time that he has been faced in the state of Florida with an on-the-spot piece of paper handed to him that tell him he is in violation of something that needs to be corrected immediately. It has a very favorable impact from the pollution control viewpoint.

Dr. MEYER. Ken.

Mr. ELDRED. I see you include in your rule a covering of various land uses. Is this going to be an advisory for guidance or does the State actually have some degree of ability to preempt local jurisdictions of something to accomplish this?

Mr. SCOTT. Thank you for your question, sir. At present the State of Florida has no agency which is given jurisdiction over land use matters. Land use matters are covered by a number of agencies—the highway department—department of transportation, excuse me—must know land-use patterns, development patterns, traffic patterns, et cetera. The department of pollution control must know much the same land use information in order to help coordinate regional sewerage systems to achieve a given quality of receiving water. There are nine metropolitan or regional planning agencies in the State of Florida which cover basically the standard metropolitan statistical areas which must know the same information. And there are a number of county area planning boards which have land use advisory capabilities. None of these have real jurisdiction.

We are aware of a forthcoming attempt through the State legislature to establish throughout the State of Florida six planning areas. This will, we hope, eliminate some of the duplication of effort.

It is, of course, encouraging when you study an area and its population projections and land use projections, you come up with your answer and you find later on that a different department has done the same thing and the answers are relatively close; but nonetheless, we see this as a duplication of governmental effort, and our legislature is making every effort to minimize any duplication, as is our desire here to minimize any duplication in State and Federal noise roles.

Dr. MEYER. Ted.

Mr. BERLAND. I am very impressed by your reasonable approach to this very difficult problem. I have a couple of questions.

Your pointing out that there are three motor vehicles for every two people in Florida remains me of the amount of Chicagoans that go down in the winter and New Yorkers that go down in the winter, and I know there is a tremendous statistic, but the high percentage of persons who go into Florida for the winter, particularly the Miami area, drive down. And that really highlights the question that we were discussing with the man from New Jersey before the break, and that is the whole question

of interstate vehicles, because you have in your situation—I am sure it is not just unique with Florida, but it just points out you have the situation of not just vehicles passing through, but actually coming in and staying for a while over a period of time, a month, whatever, and that really, I think, points up the need for some sort of Federal regulations. I would be interested in your perspective of it.

Mr. SCOTT. The density of automobiles per person is for the residents of Florida. It does not, to my knowledge, include the additional traffic from out-of-state visitors. We do know that in winter populated communities such as West Palm Beach the population can double or triple the population of the full-time residents. This is occurring during the tourist season. I am sure that much the same occurs also in the Fort Lauderdale or Broward County area, and in Miami, Miami Beach area, and to a certain extent in the Tampa area.

The mass transit that is being considered by our department of transportation particularly is relegated to the Tampa and Miami areas as being of greater need there.

Dr. MEYER. Well, I am glad you brought that up, Mr. Berland, because it does emphasize the difficulties of enforcing different standards in these requirements. It would be very difficult if Florida had an extremely restrictive standard to enforce in the case of the guy driving, as you said, from Chicago. On the other hand, the argument might well be made that Florida might be forced to have a rather liberal rule to accommodate that. So this is also a pervasive argument for some sort of underlying Federal approach.

Dr. JOHNSON, do you have any questions?

Dr. JOHNSON. Would you expect to have quantitative laws only or a combination of quantitative and subjective laws?

Mr. SCOTT. I expect it to be a combination of both, sir.

Dr. JOHNSON. And who would be the enforcement arm for static or semimobile noise violators such as compressors in construction or power plants?

Mr. SCOTT. For stationary sources, sir, our department would be. I envision that this is going to come under our permit system which is part of the chapter 403 requirements to treat noise as we would any other source of pollution, and stationary sources will be reviewed by our bureau of permitting, and by our regional offices, too, for their noise generation extent. This can be brought to the attention of the owners of the stationary sources through conditions in the permit or through prior correspondence or communications from our staff. The de novo permitting system which was established March 3, 1970, allowed one calendar year for owners of all air and water pollution sources to test their sources and to apply for a permit. They all came in, like income tax returns, on March 2, 1971, and we are still struggling to wrap up the final finishing touches on that peak workload, but we do have several thousand of these sources now under permit.

We give two types of permits, one for construction; and then if the facility meets its requirements, including presumably noise, we then give it a permit to operate.

Dr. JOHNSON. Thank you.

Dr. MEYER. Your permit system isn't a license to pollute as it is sometimes considered to be under the variance types of permit?

Mr. SCOTT. No, sir. Variances in the State of Florida require a hearing before our board. They are extremely difficult to come by, and they are limited to no more than 2 years where bona fide reasons exist.

Our license to pollute, as some would say, carries with it a pretty stiff penalty, \$5,000 a day per occurrence, with each day a separate occurrence, and we feel that this is a license not many polluters would wish to purchase.

Dr. MEYER. I see. Pave, thank you very much. It has been a pleasure to have you here with us. I appreciate this, and we will look forward to meeting with you, as we have been invited to do, to discuss some of the details of what goes on.

Mr. SCOTT. Thank you, sir.

Dr. MEYER. It is obvious that as EPA moves closer to regulatory roles it will have to have a series of conferences with the affected States and cities so that their views are reflected in the national standards.

Thank you very much.

At this point I would like to ask Mr. Robert Bennin of the city of New York—since we have a chain of thought here which I would like to follow through—if he would come forward. Then I am going to ask the representatives of the Engine Manufacturers of America to present their views. Having heard the States and cities, I think it is only fair to hear a little bit of some of the other folks' side of the story.

Mr. Bennin, it is a pleasure to have you here.

STATEMENT OF ROBERT BENNIN, DIRECTOR, BUREAU OF NOISE ABATEMENT, CITY OF NEW YORK

Mr. BENNIN. I welcome the opportunity to address the Federal counterpart of New York City's Bureau of Noise Abatement on the question of Federal and local cooperation in the fight against noise.

As you know, the noise pollution problem has reached serious proportions in this country, and I believe that nowhere is it more serious than in New York City. We think that New Yorkers unwittingly sustain injury both to their mental and physical health because of the noise levels they encounter working and living in the city. Furthermore, we are sharply aware that without generous help from the Federal Government, we cannot realistically expect to offer the public the immediate, widespread relief the problem calls for.

Our situation in New York makes us particularly eager to work with the Federal Government on the noise problem. We have made a headstart in the fight against noise. Our noise abatement bureau, established in June 1969, was the first in the country. In the past 2 years the bureau, despite limited funds and a small staff, has laid the groundwork for a comprehensive urban noise abatement program.

With the help from the U.S. Department of Housing and Urban Development, we have completed the first leg of a pilot study which will give us—and cities across the Nation—a methodology for accurate and comprehensive measurement of urban noise. In addition, we have developed a noise control code, now before our city council, which we believe will come as a model for the Nation, that is stronger and more comprehensive than any other code in the country.

The code attempts to deal with urban noise pollution in four ways: (a) Unnecessary noise statutes modeled after those already on the books; (b) specific decibel limits on a number of noise sources, such as air compressors, paving breakers, circulation devices (including air conditioning systems), refuse compacting trucks, motor vehicle horns and emergency signals; (c) it will mandate ambient noise quality zones for the different communities of the city, to be established by the administrator within 2 years of passage of the code and subject to approval by the council, and additional decibel limits based on these standards; and (d) an enforcement section patterned after the recently passed air code which will bring noise violations before our environmental control board instead of into the crowded criminal courts.

I should add, finally, that the bureau of noise abatement currently handles more than 400 complaints a month, using moral persuasion and sometimes community pressure to achieve abatement since its legal power is so limited. The code, if passed, will go a long way to increasing the effectiveness of the bureau in this respect.

The scope of the code is an indication of the scope of our future plans, since the bureau's legislative and study programs are complementary. The ambient standards, for example, will be achieved only through extensive measurement along the lines of the methodology developed in the HUD-funded study mentioned earlier. Furthermore, research will be needed to extend the code itself, applying decibel limits to a greater number of sources as the technology develops.

Currently, the bureau has a staff of seven and an operating budget of \$100,000. Clearly, the bureau will have to expand in order to implement the code when it passes. Future extension of the code and the abatement program of which it is the cornerstone will require further bureau expansion. In terms of our expense budget alone, we estimate our operating needs—including an initial inspection force of 15 as well as three equipment certification officers, an additional acoustical engineer and two electronic technicians—at \$250,000 for the coming year. Furthermore, the most basic study and development program we envision for the coming year will require funding of approximately \$500,000, for a total budget of \$800,000 for fiscal year 1972-73.

Our immediate priorities are the expansion of our community noise survey and a traffic noise survey. The community noise survey will form the basis for establishing ambient noise standards and other noise abatement guidelines for New York City. For the city, the survey will identify noise blighted areas which can be made quieter to qualify for Federal housing support ac-

cording to HUD's proposed site selection criteria. The traffic noise survey will enable us to deal with what is perhaps the most pervasive noise source in the city. By determining density and location of the most intense sources, we can then develop techniques for reducing roadway and traffic noise; for example, by changing traffic patterns and vehicular routing. In the long run, this research will be invaluable in highway and roadbuilding planning.

We are also concerned with three additional projects—a construction noise survey to aid us in extending and refining permissible noise limits for construction sources, a study to explore and assess alternatives to automotive horn noise such as buzzers and lighting systems, and a siren noise study to test and evaluate alternate warning devices or systems for emergency vehicles.

I need hardly add that the city today is sorely pressed to meet all of its most urgent financial needs, and that we cannot hope to realize our program fully within the budgetary limits we now face.

A Federal program of development, establishment, improvement and maintenance grants for local noise abatement programs is urgently needed if these programs are going to be effective. Such a program has worked extremely well in air pollution control, as we in New York City can attest. I should further point out that a system of matching grants doesn't confront the fiscal realities of cities today. We estimate, for example, that we will need a total of \$460,000 over a period of 2 years to conduct our community noise survey. Were HUD to offer us half of that sum, we could not guarantee that the city could match it. We are in the frustrating position of knowing what steps we must take to achieve a good program of noise abatement in New York City without being able to take them.

I would also like to stress that the work we want to do would be of unquestionable value to the Federal Government, serving as it would as pilot work for use by other cities.

Another area in which Federal assistance is essential to cities is that of mass transit, and, again, New York City's problems here are perhaps the most severe to be found anywhere. The New York City subway system is the largest in the world; it operates on a round-the-clock schedule and carries more people more miles than any other system. It is also one of the oldest systems, and in this fact lies the crux of our subway noise problem.

The subway system in New York City is, for the most part, unconscionably noisy; trains often reach average interior decibel levels of 90 and above, with wheel scream and instation peaks of 103 and 109 dbA. Two and a half million New Yorkers use the subway more than an hour a day; for many, there is no other affordable way to travel. Such a ride is clearly not pleasant, nor is it a healthful way to start or end a workday.

In the proposed noise control code, we request the power to set noise standards for all new subway lines in New York City. We also request power to set standards for existing lines, but we must face a proviso requiring no additional expenditures. This means that we will be able to mandate noise guidelines

whenever repair replacement and maintenance work is being done on existing lines, within existing budgets. It also means, however, that we will not be able to provide widespread immediate relief from the severe noise pollution generated by existing subway lines. It must necessarily be a piecemeal approach to the problem and one whose consequences will not be felt on a board scale for some years.

The city does not have and is not going to have the estimated millions of dollars needed for a comprehensive program of subway noise abatement, particularly in view of the fact that there are other subway problems, such as safety, dependability and a reasonable fare, that must take precedence over noise. Clearly, the city and, for that matter, the State, cannot mount a comprehensive campaign to abate noise in this area. We desperately need a commitment from the Federal Government and a shifting of Federal interest and funds away from highways and private transit, where it has traditionally been, and toward mass transit. What is clearly needed is a program of Federal noise abatement grants for mass transit, either out of an expanded office of noise abatement or out of the Department of Transportation.

In addition to establishing a system of grants for local noise abatement programs, there are a number of ways in which the Federal Government can play a powerful role in noise abatement. First, I would like to see the Government promote the use of quieter equipment by incorporating noise specifications into all of its vast purchasing programs. Second, all federally contracted construction projects should be required to meet specific noise standards. These two actions taken together would have a significant impact on the marketability of quiet devices and equipment. It is important to bear in mind that, in many cases, the abatement technology exists for a particular device, but the manufacturer must find a sufficiently large market for the quieter device in order to bring its price down to a competitive level. Air compressors are a case in point. Third, the Federal Government should make funds available for demonstration projects to promote the advancement of noise abatement technology. Last, far more research is needed in the area of the health effects of noise. It is only recently that we began to discover that noise was not simply a nuisance but a serious health hazard. The Federal Government is the appropriate leader in exploring this area further.

Finally, we believe that in addition to the crucial financial role the Federal Government must play in noise control, there is an important jurisdiction role as well. As you know, some of the major sources of noise pollution in urban areas are not susceptible of solution on the municipal level. The most obvious example of this is aircraft noise. This is the most annoying source of noise for more than a million New Yorkers who live in the shadow of airports, and who must look to the FAA, which is clearly industry-oriented, for relief. There is no question that the first thing to be done in this area is to transfer the authority to set aircraft and airport noise standards from the FAA to the Federal EPA. We would then hope to see the EPA take three steps so far avoided by the FAA: (1) Planes certified since 1969 should

be required to continue to meet the specified noise levels in a manner similar to the 50,000-mile requirement for automotive pollution standards; (2) all noncertified planes should be given no more than 3 years to retrofit their engines to cut noise emissions in half or to achieve a 10 dbA reduction in each aircraft class; (3) all planes should be required by law to meet a limit of 78 dbA 5 years from the date of such legislation and 72 dbA within 8 years. This is bold action, but it is necessary. The concept of tearing down homes—as occurred recently in Inglewood, Calif.—instead of quieting aircraft may be madness, but it should not surprise anyone if those communities who have sat powerless while their lives were disrupted by airplanes are at last going over the brink.

Finally, the noise problem created in urban areas by motor vehicles illustrates an important aspect of the Federal noise abatement role. New York City is attempting to regulate this source in its noise control code. With some 100,000 trucks and 2 million cars moving about in the city every working day, we estimate that traffic noise may be the single most pervasive noise source in the city. With our code, we are prepared to require specific decibel ceilings on all classes of motor vehicles measured at distances and speeds that reflect city driving conditions. We hope also to mobilize not only our own inspectors, but members of the police force to enforce the standards.

Realistically, however, we know that we will not be able to enforce the regulation as widely as we would like, and further, that a more efficient method for imposing noise controls on motor vehicles lies not within city jurisdiction but with the Federal Government. The most effective way to stop noise is at the source, and we would welcome Federal noise limits on all classes of motor vehicles similar to the air emission standards set by the Clean Air Act of 1970 for the automotive industry. This would greatly reduce the number of vehicles in violation of our standards, and so our enforcement efforts might well make the abatement of this major urban noise source virtually complete.

I would like to emphasize while I think it essential for the Federal Government to set specific noise limits wherever possible, it is equally important that States and municipalities be left free to set more stringent standards if they deem it necessary. Noise pollution is ultimately a local problem, even in cases, such as aircraft, where the source can most effectively be reached by the Federal Government. Federal standards should serve as a guarantee of minimum levels of relief to all citizens and as an encouragement to local authorities to deal effectively with this menace to their community's well-being. But local governments must be left free to deal with the special situations that arise in their areas.

In summary, I believe Federal efforts in noise abatement should consist of—

(1) A system of development, establishment, improvement and maintenance grants for local noise abatement programs.

(2) A re-ordering of Federal transportation priorities to favor mass transit systems, with grants to local systems for noise abatement.

(3) The incorporation of noise specifications into all Federal purchasing programs to promote the use of quieter equipment.

(4) A requirement that all federally contracted construction projects meet specific noise standards.

(5) Large-scale funding for demonstration projects to promote the advancement of noise abatement technology.

(6) Large-scale funding for research on the health effects of noise.

(7) The transfer of the authority to set aircraft and airport noise standards from the FAA to the Federal EPA, with a reevaluation and tightening of noise regulations.

(8) The establishment of Federal minimum noise standards on as many potential sources as possible, including motor vehicles.

In conclusion, noise in our cities can no longer be ignored. It is a problem ranging in seriousness with pollution of air and water. It must be attacked vigorously by all levels of government, by industry, and by the individual citizen.

Thank you.

Dr. MEYER. Thank you very much for a comprehensive statement on how New York City is trying to approach the problem and what they think needs to be done.

I will start off with Dr. Johnson.

Dr. JOHNSON. I am curious as to what relationships you are exercising with other organizations, such as the State of New York, that you intend to incorporate with the EPA, for example.

Mr. BENNIN. To date there has been nothing at the State level. There is no structure yet for an office of noise abatement. I believe it is contemplated. We have given them as much input as we have developed in terms of our own program planning and in terms of the noise pollution code.

Dr. JOHNSON. Which segment of the State do you have those inputs into?

Mr. BENNIN. Well, we have now been going through the air pollution people actually; noise has been considered, I think, in the last legislative session under the public health law. They considered and passed a law amending that to include noise as an air contaminant. So we are working with the air quality people.

Dr. JOHNSON. Thank you.

Dr. MEYER. We have had some communications from Mr. Metzler, who unfortunately wasn't able to get someone here, from the department of environmental conservation. It is my understanding that they are in the process of attempting to put a staff together. As you indicated, the law has been modified now to provide for some State activity. But about all they are doing now is planning, I believe.

Mr. BENNIN. That is correct. I might add in that connection that we would be delighted to work with any other municipal organization, including the Federal EPA, in any work we have done.

Mr. BERLAND. I assume you looked at the ordinances of Chicago and other cities to see what they have been doing, is that right?

Mr. BENNIN. Yes, I have.

Mr. BERLAND. One of the faults of the Chicago ordinance is, in my opinion, that they specifically exempt under construction. I notice you don't mention it here, but have you?

Mr. BENNIN. We have deliberately excluded all other construction equipment except that that has been listed, and the basic reason being that we did not understand the full impact of both the technology and what could be done with the present state of the art. This is why we are commissioning a 6-month study to evaluate at least 25 different construction sources and different sites for the very purpose of establishing incremental reduction in that noise level.

Mr. BERLAND. Is this code so written so that there would be increments of reduction over a period of years?

Mr. BENNIN. Yes, I believe that is probably the most effective way. There are two approaches to this thing particularly in the automobile, but I think it applies very well in construction equipment, and that is an operator standard and a manufacturing standard where you incrementally reduce over a period of years existing equipment, because you obviously couldn't mandate it out of existence; and with newly manufactured equipment as of a certain date you mandate also an incremental reduction in new manufactured equipment to be sold and operated in a given area.

So the approach is always on an incremental basis, in some instances, perhaps in many instances, starting out with the technology as it exists and perhaps just shoving a little bit.

Mr. BERLAND. Now the code is going to cover horns and signals—but you said you are going to have a study on these things. Is the code going to wait for the study, or are you going to have some provisional—

Mr. BENNIN. Well, the code is taking, I think, at the legislative level just a little bit longer than we anticipated. When we first envisioned the code and we first drafted it about a year ago we had assumed that the studies would have been underway; we envisioned about a 3- to 6-month study on both of them and we would have had the feasibility or the technique for actually reducing it.

But I think what we are doing is working in another area. We are dealing now with different techniques of the detectability, and while we do mandate given levels we do not rule out the usage of existing equipment, except that what we are trying to do is force the industry to begin to consider something other than the historically increased noise level for signals.

Mr. BERLAND. That means horns and—

Mr. BENNIN. Well, particularly those.

Mr. BERLAND. I should know, but I don't—who runs the subways in New York? Is that a metropolitan authority?

Mr. BENNIN. It is a confusion of people. It is the TAD, TA, and MTA; one being the parent, the MTA, which is the metropolitan transit, guided at the State level. The operating arm of that administrative level is the TA, and of course, that is the city, who is responsible for the coin boxes and the maintenance and salaries, et cetera. So there is a division of responsibility, but no clear establishment of responsibility.

Mr. BERLAND. So there would be no problem in your passing any municipal code that would cover the subways?

Mr. BENNIN. We don't believe there will be.

Mr. BERLAND. Chicago, and I am sure other areas—every city has its own problems as to who operates which, the buses, the subways or other kinds of transit systems. And that's why—

Mr. BENNIN. Well, we are not convinced that we know, except we hope the code will at least bring that to the fore.

Dr. MEYER. You will find out on the courthouse steps.

Mr. BERLAND. Of course, there's other kinds of real noise in cities, including New York, particularly interurban rail. Would your code cover that, too?

Mr. BENNIN. Not really, no. That would be a jurisdictional matter, I believe, if I understand your question.

Mr. BERLAND. Well, you have other kinds of trains in the city of New York, as in Chicago, besides the subway system.

Mr. BENNIN. Yes, it would. It would do that through the ambient standard. We may have some difficulty through that agency which regulates the railroad.

Mr. MARTIN. Perhaps you can address yourself to the Long Island Railroad or the New Haven, which are all part of the MTA.

Dr. MEYER. Or even more specifically, if I am not mistaken, most of the freight that is moved by rail to the docks of New York City is moved by a local railroad division. And I think a good bit of that trackage and equipment is within the city limits—actually within Manhattan.

Mr. BENNIN. The intent is to regulate, I think, through the ambient standard, because we do talk about railroads and the inclusion of subways.

Mr. BERLAND. Just one last question. Is this code or any other part of the city ordinances going to approach the problem of industrial noise? In other words, industry located within the city that is exempt from Federal law. Do you envisage covering that with this code or another code?

Mr. BENNIN. No, actually not, because more recently the State is considering or has had public hearings on rule 49 which in fact adopts the Walsh-Healey Act for the entire State of New York. Now I don't know what the status of that is presently, but that is the intent.

I think it would present us with a tremendously burdensome enforcement problem if we would move into that particular area. We have to deal really at the government level, at the city level, with the health and safety of the general citizen. Those that are outside, they will be covered by the Department of Labor.

Mr. BERLAND. Otherwise I congratulate you on your statement. I think it is very good.

Mr. ELDRED. Have you developed a fair notion of how much additional noise reduction would be required in motor vehicles over the amount that would be required by New York standards and California standards to get a reasonable handle on the downtown city noise problem?

Mr. BENNIN. Well, curiously enough—I just want to preface my remarks with this—New York State passed the noise law

in 1965, California adopted it, and very nicely they have had, I believe, over 9,000 convictions; we have had three. Of course, Ross has done a magnificent job in enforcing it.

What I am getting at is we are patterning our motor vehicle standards after the present State law, and we will be working rather closely with California; so at least we will have two ends of the country covered and we will squeeze everybody in between under.

Mr. ELDRED. Do you think the magnitude of the noise reduction that is required to meet that standard is going to give you significant relief in your city?

Mr. BENNIN. No. No, I don't think they will be. I think we have stretched it out incrementally, that I think we can deal with the problem. There are other ways around—I am talking at the manufacturer's level, we can reroute traffic, all sorts of things, in our roadway planning surfaces, et cetera.

Dr. MEYER. Mr. Mayor.

Mr. WISE. Yes, I am thinking in terms of citizen acceptance of more stringent noise standards or noise ordinances when I ask this question. You refer to a program that has "worked extremely well in air pollution control to which we in New York City can attest." Is this improvement visible to the citizen? In other words, is it something that he can actually see an improvement in?

Mr. BENNIN. Yes, it is. And I think it will be even more obvious in noise.

Mr. WISE. That is the point I wanted to make. If it is visible and if the person can hear the index on the radio, an improvement over what it was 3 or 4 years ago, and you can apply that same thing to the noise control, you will come back to what we were discussing this morning, the acceptance of the general public of an improved situation will take care of much of the law enforcement problem, I think, because people will see it and they will obey the law themselves because they like the improvement.

Mr. BENNIN. Well, to some extent initially, yes. But when you talk about the ultimate reductions to real healthful levels I think it will probably always be the municipal function.

Mr. WISE. Yes, I agree with you. You still have to have the ordinance to back it up.

Mr. BENNIN. Oh, yes.

Mr. MARTIN. A smile on my friend's face here—being from New York myself. Bob, has the city as yet instituted any purchase specs related to noise for equipment?

Mr. BENNIN. Yes, we have. As a matter of fact, a year ago I wrote a noise specification that has been included in all of the purchases for construction equipment for our own agencies, department of highways, public works—as a matter of fact, we have just had the first delivery about 2 months ago. I might add, too, that we also have a noise specification for the North River sewer interceptor project which is being put in now on the West Side of Manhattan, and TA, I grudgingly might add—they, too, have noise specification that has been included now in construction of the second half of the subway.

Mr. MARTIN. In your paper and in, I believe, part of the noise code you have got certain projected levels for aircraft that you would like to see; and some of these, as I look at them, might eliminate an awful lot of aircraft from flying into any airport in New York because I don't think many of them will ever get down to some of these levels. Do you think the city would institute, if they could—I know the FAA has some rules here that prevent you right now—but if they could, do you think the city would want to see levels instituted that could substantially affect their economy?

Mr. BENNIN. Of course not.

Mr. MARTIN. And the use of the airports around New York are a major part of the economy.

Mr. BENNIN. Of course not. It would be like saying we are against motherhood. We fully recognize—I think what is being reflected here, if I may say, is the desperation really of the local community in terms of the problem they are suffering; and I think that, you know, the State—and I might say that the Federal Government has been rather slow in responding. And the testimony that went on earlier on the jurisdiction problem between the Federal Government setting minimal standards and the local community doing the more stringent standards—I think what was being reflected again is this desperation at the local level, and the recognition that we first recognized the problem, we pass it to the State, and remember that the State and the Federal Government have an excellent overview of the entire picture. But it is the local group—in fact even the local police precinct captain who knows the problem probably better than the commissioner of police.

So I think this is the concept. And getting back to what you said—no, of course, we wouldn't want to see the aircraft industry affected. But I think what we have got to do is to force someone to realistically establish a program of abatement both in terms of new aircraft and perhaps even retrofit. But something must be done. I mean, as I point out in the testimony, consider the magnitude of what California has been forced to do. If they go ahead and condemn the 1,900 homes it will have cost \$1.6 billion and they will have only solved the problem for Los Angeles. How about Chicago, New York, St. Louis? So what we should do is take that money and redirect it, and I think that is the key here.

I think really rather than involve ourselves in a numbers game we ought to look in terms of philosophy or a commitment, and that is where it really hangs.

Dr. MEYER. Dr. Dietrich. This is much in your field.

Mr. DIETRICH. Well, I don't quite know about that. I was going to ask two questions. First, you allude to some noise regulations for motor vehicles, and, of course, the State of New York has a regulation now. Are your plans to have separate regulations for the city of New York that would go beyond those, that would, let's say, be tighter than the present State regulation?

Mr. BENNIN. No, Dr. Dietrich. What we have asked for principally is two things. What we intend to do is to be able to make a 25-foot measurement. Presently the law says 50. We will ex-

trapolate it down to 25, provide 6-decibel increase. I know that ideally it may not be a 6-decibel—I understand the field effects, I understand we may be in a reverberant condition. But I really believe some of the technology specifically developed—as a matter of fact, if you really look into it, without going into the technical discussion, I think that the ISO standards make all their measurements between 17 and 21 feet, they are running at about 7 meters. And so the way we intend to measure the vehicle, we are looking for a maximum sound pressure level opposed to any sound power, et cetera, and we would really favor the violator by doing it at close—

Mr. DIETRICH. I understand that. I think I understand your testimony then, is you are looking for a more effective way of enforcing the present limit in a way that can be used readily within the city confines.

Mr. BENNIN. Precisely.

Mr. DIETRICH. I appreciate that need, which has been expressed to the panel before in other hearings.

My second question has nothing to do with motor vehicles at all, but the effects of another noise source. Certainly New York City has a large number of inhabitants, and certainly they live in close proximity to each other. We talked about regulating the noise of new products, the desirability of such regulations at the Federal level, because obviously as they use those products they annoy each other. What about products which have the following capability—that is the noise that they produce is controlled by voluntary action of the operator, and I am thinking of the home entertainment music systems, TV, radio, et cetera. It has been suggested in other government agencies, regulator agencies, that it is desirable to take certain maximum capabilities away from a product—I am thinking in the case of motor vehicles—and set a limit of how fast they can go irrespective of what the operator might wish.

Do you believe in the case of home entertainment devices that it will ultimately be desirable for a city to wish that they have some kind of maximum limit or governor built into them?

Mr. BENNIN. No, I do not. I think the whole concept is completely different in the home entertainment. I think we have to recognize and should recognize—this is my own personal feeling—I think that in the particular instance here that anyone wishing to sense or live and enjoy this kind of music, he should, if he desires to do that—I think it would be his responsibility when to in effect insulate himself so that someone else would not have to live with it. But I don't think we should put a maximum limit on that kind of—that is one of the areas that I would consider exempt.

Dr. MEYER. Would you feel that rather than just having to insulate himself because the structure was basically relatively transparent in noise that the building code ought to provide certain minimum sound transmission classes between apartment units?

Mr. BENNIN. Yes, but those minimum sound transmission requirements between apartments would never cover the kinds of—

Dr. MEYER. But there are certain interior noises, though, that they would provide for.

Mr. BENNIN. Yes.

Dr. MEYER. For example; the average television set, at the average level that a reasonable person might be expected to enjoy; but they wouldn't provide for someone who wants to get 45 or 50 watts out of a hi-fi set?

Mr. BERLAND. Mr. Chairman, I think it should be pointed out for the record that New York in terms of sound transmission probably has the best built-in code in the country. Passed in 1969?

Mr. BENNIN. December 1968.

Mr. BERLAND. May I ask a question?

Dr. MEYER. Yes.

Mr. BERLAND. You have a very effective citizens group in New York City, and I think it might be of interest to this panel for you to give some feedback in terms of how a citizens group such as that can help a city administration such as your in its noise abatement program.

Mr. BENNIN. Well, probably the most effective thing they can do is lobby for the proper laws. I mean they can help us in public awareness and kinds of things, but mostly I believe in supporting the programs, the budgetary programs and any laws that we try to get through city council.

Dr. MEYER. Let me address myself to several items. First, again I want to thank you for this excellent summary of how New York City sees the problem and what they think the Federal, State, and local relationships ought to be. And I would like to assure you and your chief, Mr. Kretchmer, that we will look forward very closely to working with you and the other major cities.

I would also like to point out that we recognize the importance of some sort of assistance effort from the Federal Government to the States and their principal political subdivisions. We are not at all sure that the past procedures with regard to grants, though, is necessarily the best way of providing this.

I would like to ask you a question. If the technical assistance program was structured so that, say, New York City's needs could be met with some financial support within some sort of a formula which recognizes that your needs might be completely different from Mayor Wise's needs in Dallas, how would you feel about that sort of a program? It isn't really a grant program. It is a straightforward technical assistance between the Federal Government and the city. That is, even if you have got 7 million people, your percentage of the pie is not based on the number of people, but on what your actual problems and needs are.

Mr. BENNIN. That might be a very good approach. Yes, I think it would be quite good. I think we have seen some very serious shortcomings in the cost sharing that has been going on prior to this, and I think we should have a new slant on it.

Dr. MEYER. If you have any thoughts on this I would appreciate it, and I would also say the same thing to the other witnesses from States and municipalities. We are trying to come up with a new approach to this problem. We see some ways of having

a better Federal-State-city partnership than the strict formula grants, and we would like to look into them.

I completely agree with you regarding the need for inclusion of noise control requirements in Federal specifications and contracts. It is something this office is already working on—get that in the record. We are taking a look at this and coming up with some suggestions.

To that extent I would appreciate it if you would send us a copy of the specifications you mentioned because we are trying to build a file on it.

Mr. BENNIN. Yes, I will be glad to.

Dr. MEYER. And again I say I look forward to working with you and your office.

Mr. MARTIN. Just delving on that, have any of the buslines in New York instituted any noise control specs?

Mr. BENNIN. No, they have not. They haven't as yet.

Mr. MARTIN. I am not too familiar—I hate to say it, being a New Yorker—except the green bus being an independent, but are all the others part of the MTA and transit authority?

Mr. BENNIN. Yes, they are.

Mr. MARTIN. So they would fall under the city?

Mr. BENNIN. They would fall under the city jurisdiction.

Dr. MEYER. At this point we are going to do what we didn't do this morning, take a 10-minute ecology break, following which we will hear Mr. Young and Mr. Gebman of the Rand Corp., then Mr. Cusamano of the Nassau County Bureau of Air Pollution.

(Recess.)

Dr. MEYER. All right, we will proceed. We have with us Messrs. Thomas Young and Jonathan Howe of the Engine Manufacturers of America. They have appeared before other panels, and we are happy to see you again, gentlemen.

STATEMENT OF THOMAS C. YOUNG, EXECUTIVE DIRECTOR OF THE ENGINE MANUFACTURERS ASSOCIATION

Mr. YOUNG. Thank you, Dr. Meyer and panel.

I am Thomas C. Young, executive director of the Engineer Manufacturers Association. The association is located at 111 E. Wacker Drive, Chicago, Ill. A list of members of this association is attached and includes major manufacturing companies in the United States producing gasoline, diesel, and gas turbine types of internal combustion engines for all application except passenger car and aircraft. The engines of our members are used in truck and bus, off highway and construction, farm and industrial, stationary, marine, locomotive, lawn and garden, and recreational applications.

We should like to make it quite clear that we are speaking as an association representing engine manufacturers only, with technical and legal expertise and experience in engine emissions. We do not speak for vehicle manufacturers or construction equipment manufacturers, or any other end-use or end-product manu-

facturers or trade associations utilizing the engines covered by our association. We do feel a responsibility and are quite willing to share our knowledge and information with other associations or with branches of State and Federal Governments where we can be of assistance.

The association deals primarily with the development of non-proprietary baseline data, the development of test procedures, model regulatory codes and instrumentation, and studies technical and legal aspects of the control of all types of emissions including noise from internal combustion engines. We have much experience in the smoke and gaseous emissions area. This experience increases our concern with inconsistent standards now being applied as noise regulations, which we feel will detract from and not improve the noise abatement program. Mr. Jonathan T. Howe, legal counsel for EMA, will speak to this subject and other legal aspects.

I would like to address three basic topics in these final summary hearings. It is important to attempt to summarize some of the important aspects of noise abatement and control. It is also important to relate these noise abatement efforts to the broad attack on pollution control in our society, particularly from the viewpoint of the consumer or voter. Thus, my comments will discuss the following subjects: (1) Economics and cost effectiveness; (2) National noise monitoring network; and (3) Need for a balanced approach.

1. ECONOMICS AND COST EFFECTIVENESS

Published literature and reports on cost and other economic data concerning noise abatement and control is fragmentary. Unfortunately we must estimate the abatement effort largely on intuition. However, we should attempt to include all available economic data in the development of an abatement program, even though the data base may be inadequate, at the present time. Naturally, we should plan appropriate research on this important parameter of the noise abatement effort.

Those familiar with research and development activities know that many laboratory solutions to technical problems cannot be applied in the marketplace, since their costs exceed those of the methods or products in use. Since noise abatement efforts must eventually meet the test of the marketplace, it is imperative to evaluate the economics to insure a successful abatement program.

We feel the following factors need evaluation to the extent of the available data. This is very important since it is prudent to avoid the type of pollution abatement contradictions now facing us in phosphate and mercury pollution, where the credibility of the regulations are under question, apparently due to inadequate research. It is for this reason that we support and commend the survey of the present state of the art contained in title IV of the Clean Air Act, of which these final summary hearings are an important part. We should take time to study the relevant lessons of our past.

We feel the following comments on economics and cost effectiveness are important:

1. The data base on cost effectiveness of noise abatement alternatives and on the cost parameters of noise abatement de-

vices, and procedures, is inadequate. Due to extreme lack of data it would be dangerous to generalize, but some data available indicates certain aspects of cost changes which should be investigated.

2. It is a commonly held view that the primary change necessary to lower significantly the noise emissions of engine-powered equipment is the installation of a better muffler. Naturally, in urban environments there are other noise sources which contribute to the prevailing ambient noise level.

The California Highway Patrol has been active in measurement of vehicle noise for some period of time. As is well known, they do find some vehicles operating with minimum mufflers frequently different than those recommended by the vehicle manufacturer. The user has the option of purchasing a cheaper and perhaps more noisy muffler when it is replaced. Thus, the abatement effort must recognize that effective enforcement also must control the user, who shares some of the responsibility for noise emissions in our society.

It is true that significant noise reductions can be achieved by design changes in mufflers or muffler systems. In the Chicago hearings of EPA, Caterpillar Tractor Co. testified that reductions of 10 dbA and more, comparing experimental mufflers with the bare engine noise emissions, had been achieved. They also stated that this noise reduction caused an increase in back pressure and thus included a performance trade-off.

Briggs & Stratton testified in Denver EPA hearings that muffler and other engine modifications on an 8 horsepower riding mower could do the following things: (1) Lower noise emission 5 to 6 dbA for muffler modification and 10 to 12 dbA including other changes; and (2) Increase costs about \$55 to \$58 on equipment selling at about \$250 or a percentage increase of 22 percent in first cost alone. This is for muffler and other engine installation modifications.

3. Noise abatement design and devices will cause increases in several kinds of costs in addition to equipment costs, and performance trade-offs will be required to lower engine-powered equipment noise emissions.

Both of these points are demonstrated clearly by testimony of Outboard Marine Corp. in Denver EPA hearings. I would like to repeat it briefly here as EMA testimony, since it clarifies these two aspects of noise abatement economics. We do feel these comments apply to several important classes of engine-powered equipment:

Because we are not sure at this time which design techniques will be employed to achieve the varying degrees of quietness, we can only estimate the increased costs. For the record, these new quieter products will, probably without exception: (1) Weight more; (2) be bigger and bulkier; (3) cost more; and (4) be more difficult and expensive to service and maintain in their original "factory-quiet condition." We expect that costs and weight penalties will be in the range of 10 to 30 percent depending on what is demanded of us for each product's noise levels.

To attain quieter products, we must be prepared to trade off, to some degree, many of the design goals which have been achieved in response to market demands.

Lightweight, low cost, portability, ease of operation and use, and simplicity of maintenance, are design goals which should not be cast aside lightly. Recognizing that price increases will be inevitable, and will deprive some

people of the use of the product, we must study the cost/benefit curve in each case. In his recent report to Congress, President Nixon stated that a sense of realism must be applied when seeking to make environmental improvements. Mr. Nixon said: "It is simplistic to seek ecological perfection at the cost of bankrupting the very taxpaying enterprises which must pay for the social advances the Nation seeks." He called for development of a "realistic sense of what it will cost to achieve our national environmental goals and choose a specific level of goal with an understanding of its costs and benefits."

Thus it is important to emphasize that in addition to increases in original equipment costs of 10 to 30 percent, the consumer will also bear the burden of increased costs of—For the user: (1) Operating costs, heavier weight mobile equipment may well reduce fuel economy or payload; (2) maintenance and service costs, noise abatement devices and controls will increase hardware in the engine compartment and may well increase labor costs in removal for service of the engine.

For the equipment manufacturer several types of costs will increase, including: (1) Research and development costs; (2) testing costs; (3) tooling costs; (4) material and labor costs.

For the control agency, primary costs increases will occur in: (1) Research and development costs; (2) enforcement and abatement program costs.

For these reasons it is important to recognize that, in the long term, all of the above costs will be ultimately borne by the consumer, in the marketplace and as a taxpayer.

4. Noise abatement costs discussed above must be related to overall environmental programs, each of which include similar potentiality of major cost increases and will come to bear on the consumer's pocketbook in the decade of the seventies.

We urge careful consideration of the impact of total pollution abatement costs for all pollutants on the national economy. The consumer will feel the total impacts of the following major pollution programs: (1) Noise abatement—engine powered equipment; appliances (perhaps depending on labeling); (2) mobile source air pollution—autos, trucks and buses; (3) stationary source air pollution—electric power; SO₂ and particulates; industrial plants; (4) solid waste and sewage; (5) water pollution; (6) in addition to pollution abatement costs, there are safety costs—motor vehicle safety; air bags, bumper modifications, safety autos.

EPA, DOT, FAA, and many other Federal and State agencies are pursuing parallel programs of pollution abatement.

The costs of pollution abatement lag development of standards and control devices. Thus, it appears that the full cost impact of total U.S. pollution efforts may be placed on the consumer between the years 1973 and 1980.

The Nation is attempting to overcome 50 years of relatively uncontrolled pollution in the decade of the 1970's. The noise abatement effort and all other pollution abatement efforts must be coordinated if cost-effective abatement acceptable to the consumer is to be achieved. We do not believe that the consumer is willing to accept a program of pollution abatement, without full consideration of basic cost aspects as a major parameter.

II. NATIONAL NOISE MONITORING NETWORK.

I would like to say parenthetically I should amend that sentence, we had not heard of any until these hearings. You will recall, of course, today Dr. Mayo's comments about equal recommendations from the study of the political and legal aspects, and it seems to me if I read the discussion of Gordon Bricker of Northrup correctly, that the survey and monitoring network technology is already with use, and has at least hopes that the national will not require significant amounts of trained manpower. It seems to be reasonably well automated.

In addition, Dr. Lentz indicated that the cost of \$312,000 for one city, it appears that those States and municipalities just do not have the funds for the technical people to conduct surveys or monitor their noise efforts.

1. Returning to the text, we recommend that this become an objective of the Office of Noise Abatement and Control and that they investigate and select the cost method most effective to establish and implement such a control network.

The Chicago noise report of Bolt, Beranek & Newman, Inc. commented on this problem for the municipal situation. Quotations from their report state:

There seems to be little debate that the noise environment in urban areas has become progressively worse over the last few decades.

Yet in contrast to air pollution evaluation, very little is known about the actual existing noise environment and how it changes on a daily or seasonal basis, and nothing about the changes over a period of years.

In the present state of establishing urban noise criteria and determining their validity, we are, therefore, working completely on intuitive notions supplemented with fragments of data in a few specialized situations. We have no long-term noise histories to guide us in the appropriate statistical measure of noise, and we have no knowledge of where the statistical approach fails and must be supplemented with knowledge of the noise levels for specific vents.

It appears highly desirable to obtain specific knowledge of the short- and long-term statistics of noise exposure at representative locations in the major metropolitan area.

We believe that a national noise monitoring network can be shown to be the most cost-effective means to survey ambient noise emissions levels and monitor performance of noise pollution abatement efforts.

2. Surveys of ambient emission levels in our urban (and total) environments must be made to develop standards which will result in abatement of these levels. A national noise monitoring network could perform such surveys.

Prevailing ambient noise levels in our cities should be the primary focus of the abatement efforts and standards. They result from the operating modes of a wide variety of equipment and total emission levels comprise the net effect of the density of the noise sources and affected population. Yet most present test procedures measure maximum noise emissions from engine-powered equipment.

Point-source standards set on engine-powered equipment which reduce noise emissions for that specific application as measured by maximum noise test procedures may or may not reduce ambient levels depending on the difference between the maximum level and the equipment's normal operating mode, and the density of the equipment in the city.

The ambient noise emissions from each vehicle in a line of traffic is lower than its maximum noise emission level since city operation is not normally at conditions where maximum noise emissions occur. Further, since data on the net effects of varying densities is fragmentary, it is not possible to set technologically feasible standards without surveys of existing ambient levels in our urban environments.

Several charts from the BBN Chicago noise study on noise levels in various cities are attached. The test procedures may differ somewhat, but they illustrate the point that ambient levels in different cities differ by a significant amount. A national monitoring network should consider this problem in its selection of appropriate sample cities.

3. A performance yardstick is required. Measurement of ambient noise levels and the rate of change of ambient noise levels in our urban environments is required for several important reasons, as follows: (1) Measurement of the cost effectiveness of abatement efforts requires validation of the change in annual levels, on an appropriate sample of cities; (2) measurement of annual improvements in emission levels will allow the abatement agency to speed up or slow down the abatement effort; (3) we know that densities of noise sources and population are changing rapidly and annual data will record the net effect of the change; (4) BBN noted that historical data is totally absent and a data base for forecasting the trend and rate of change must be established.

4. Noise levels are increasing 1 decibel per year.

There is a widely misquoted statement attributed to Dr. Vern O. Knudsen with regard to the rate of change of noise levels in our society. We should like to provide the proper interpretation of this statement.

Dr. Vern O. Knudsen, professor of physics and chancellor, emeritus, University of California actually said:

In 1954, on the occasion of the 25th anniversary of the founding of the Acoustical Society of America, I reminded acousticians and the public that during the preceding 25 years the loudest noises to which man was exposed increased 25 decibels, from 125 to 150 dbc (about 110 to 135 dbA), an average of 1 decibel per year.

And again:

An article in the February 1970 issue of Scientific American reports that from 1936 to 1963 the take-off noise from civilian aircraft increased from about 100 to 130 dbc, thus continuing its inexorable rise of at least one decibel per year.

I have gotten a copy of the February Scientific American article, and the district referred to is one chart in an article which has as a title "The Assessment of Technology," and reading the chart the figures appear to be correct as Dr. Knudsen has read them, but it compares a Douglas DC-3 with a Boeing 707. I have no knowledge of whether the test procedures are similar, whether the measurement distances are the same, whether the instruments are the same, whether they are directly comparable or not. I just don't know. I haven't been able to follow back to the original data.

We do not know the extent of the data base involved but this quotation refers to maximum noise, not ambient noise, and it

does not refer to the 25 years preceeding 1971—that is, 1946–71—but to the 25 years prior to 1954 or the 27 years prior to 1963. As BBN has said, we do not have an adequate data base on the historical trend in ambient noise levels.

Finally, EMA wants to state that some types of engine powered applications are already being improved with regard to their noise emission levels. Inspector Craig of the California Highway Patrol testified in San Francisco that engine powered vehicle manufacturers were cooperating with the California Highway Patrol and, as a result, noise emissions from those classes of equipment were being abated successfully in the State.

III. NEED FOR A BALANCED APPROACH

To use a "reductio ad absurdum" analysis one can say that only a very small percentage of our population wants noise levels so low that they would have to push lawnmowers and ride bicycles to eliminate all of the engine powered equipment which provides for our social and recreational needs.

On the other hand, no one would be inclined to conclude that noise is not a problem and that controls and standards are completely unnecessary. EMA concurs that there are sufficient data to indicate that noise is a national concern and that uniform enforcement and control are vitally necessary.

The primary pressure for noise abatement and control seems to come from special interest groups, offended by noise levels and sincere in their dedication to lower such levels. We respect their rights to seek such social changes. However, respectfully, we would like to suggest that there are other groups who also have rights which must be considered in a balanced approach to noise abatement. The primary groups involved in noise abatement programs include the following:

(1) The user who purchases and uses a machine for a social good. For example, a citizen buys a power lawnmower to maintain an attractive property and reduce time and effort required to cut his lawn. This machine emits noise.

(2) The neighbor is bothered by the noise emitted from his neighbor's mower and requests quieter equipment or complains to your agency, even though he may use a power mower on his own lawn (possibly of equal or higher sound level).

(3) The manufacturer produces the product using mass production techniques to serve the public and answer the desires of consumers trained to seek the most value at the lowest prices. In the process, he provides jobs and contributes to the economy and the welfare of the country. Adequate protection through uniform enforcement procedures should be provided to the manufacturer, who must add weight, bulk and cost to his product to meet noise abatement regulations.

Proper noise regulations must consider the interests of all of these persons by balancing economic reasonableness and technological feasibility with the degree of acoustic annoyance.

Thus, the EMA agrees that noise is a matter for national concern, however, there is a severe lack of adequate data on important parameters of the problem, hence, the need for research and development. Means to abate noise must be researched, developed, tested, tooling purchased, production tested and field

tested before introduction into the mass produced products which are a hallmark of the U.S. economic scene. This requires substantial lead time, generally measured in years, ranging from about 3 to 7 years for most engine powered equipment manufacturers.

In addition to major technical and economic problems, there are serious enforcement problems which require a uniform approach and we encourage development of uniform model codes, test procedures, enforcement, and training methods. Our summary of State legislation, submitted in San Francisco, proves beyond a doubt that the States will provide an undesirably diverse approach to noise abatement. Since we can find no alternative method to gain uniformity of regulatory control, we strongly support Federal standards and Federal preemption. Although data on important parameters are scarce at this time, we must attempt to minimize the intuitive aspects of our approach and maximize the objective aspects as we research the problem areas and move forward to a quieter society. No one wants to hear the clarion call of Joshua's trumpets and see the walls come tumbling down around our feet.

The Engine Manufacturers Association deeply appreciates this opportunity to present its views. The association is ready to provide its services to other trade associations or the Federal Government in any way that will aid in proper control and abatement of noise emission under conditions of reasonable cost acceptable to the general public. We will be pleased to try to answer any questions you may have after Mr. Howe completes his remarks.

(Attachments follow:)

INTRODUCTION

Noise, at long last, is being recognized as a major pollutant. It is often referred to as the New Pollutant. In fact, it is one of the oldest. Thus, two thousand years ago, Horace complained about the noises that harassed the man of letters in the Eternal City. A translation of his Epist. 11.2 follows:

"The hot tempered contractor is hurrying about with his carrier and mules;

A mighty machine turns here a stone, lifts there a wooden beam.

Mournful funerals contend with heavy wagons

(to see which makes the most noise);

A mad bitch flees over that way, a filthy sow wallows around here.

But now, along with you; I am resolved to meditate on my songs."

English law (Act of 1864) allows a householder to send away street musicians, and to this day they are required to keep moving. James Sully, writing on Civilization and Noise in the Fortnightly Review (1878), discusses this and other legal aspects of noise control. He assures us that it was possible to restrain noise as a nuisance, and cites a celebrated case in which the plaintiff obtained an injunction to restrain the ringing of bells at unreasonable hours in a chapel near his dwelling.

Recent attempts in our own country at the control of noise by legal action and injunction have been gloomily while. Much of this futility, I believe, is attributable to the lack of proper regulatory codes based upon appropriate quantitative standards and regulations. What is needed to formulate the required standards and regulations is clearly set forth in this report, a subject in which the principal author, Dr. Melville C. Branch, has had an active and laudable interest during the past five years.

Among acousticians, at least until recently, I have been dubbed the Number One Noise Hater in the nation. I have inveighed against noise for over

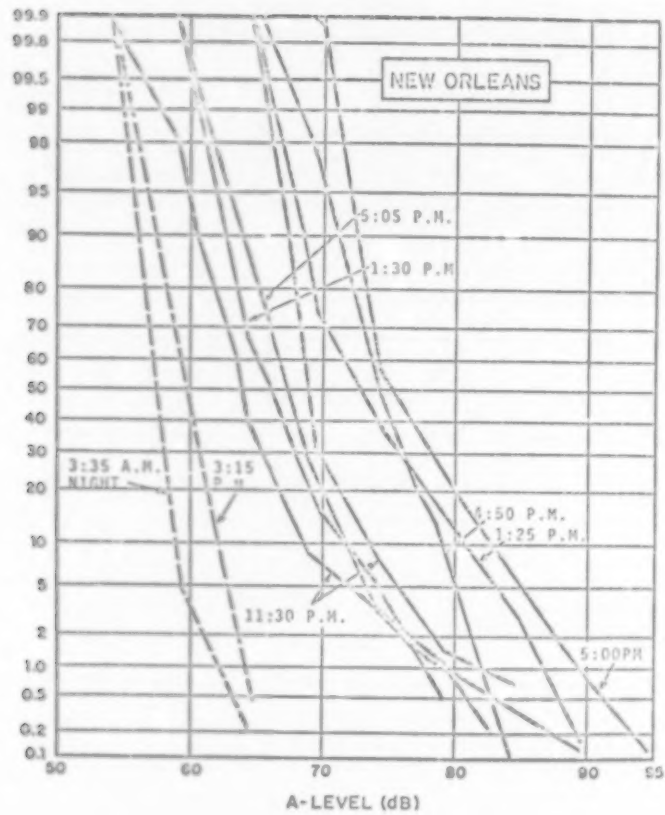


FIG. 11 URBAN NOISE LEVELS: JACKSON SQUARE,
NEW ORLEANS, (Ref. 48)

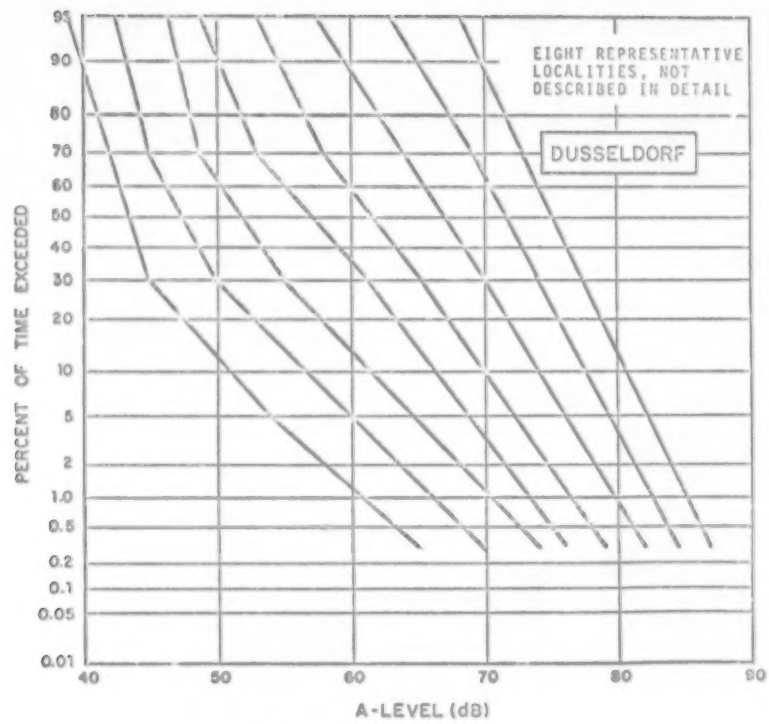


FIG. 10 URBAN NOISE LEVELS: DUSSELDORF, WEST GERMANY, (DAYTIME ONLY). (Ref. 29)

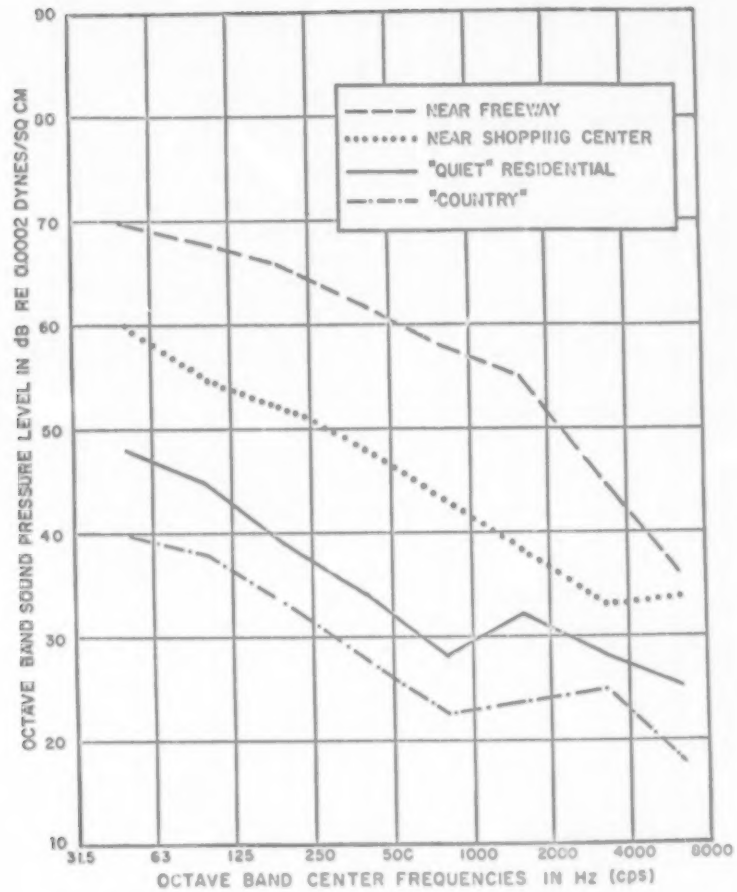


FIG. 5 COMMUNITY NOISE LEVELS IN AUSTIN, 1958 (Ref. 246)

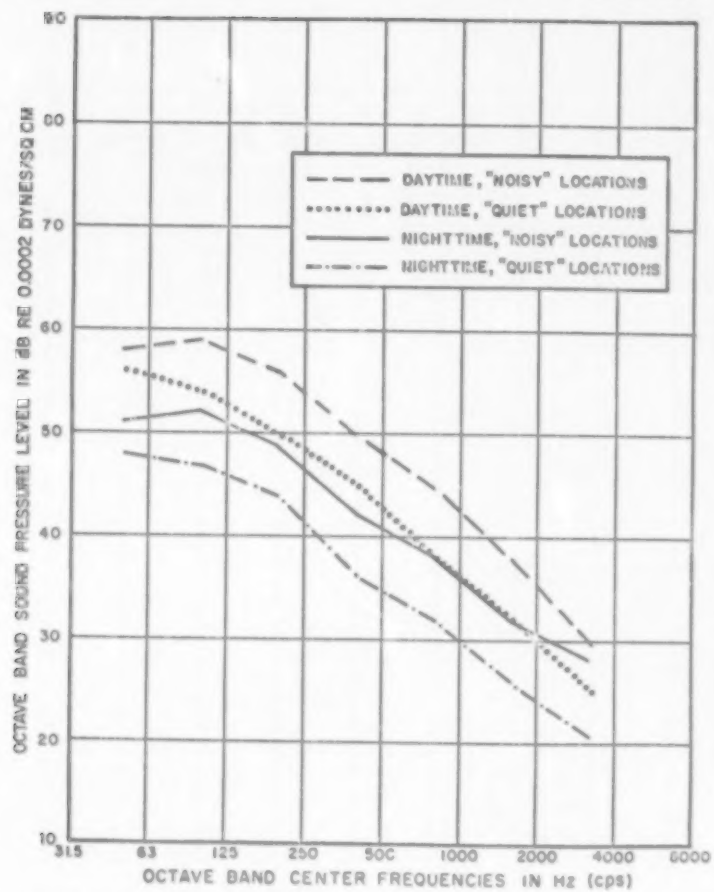


FIG. 4 URBAN NOISE LEVELS IN TUCSON, 1958 (Ref. 245)

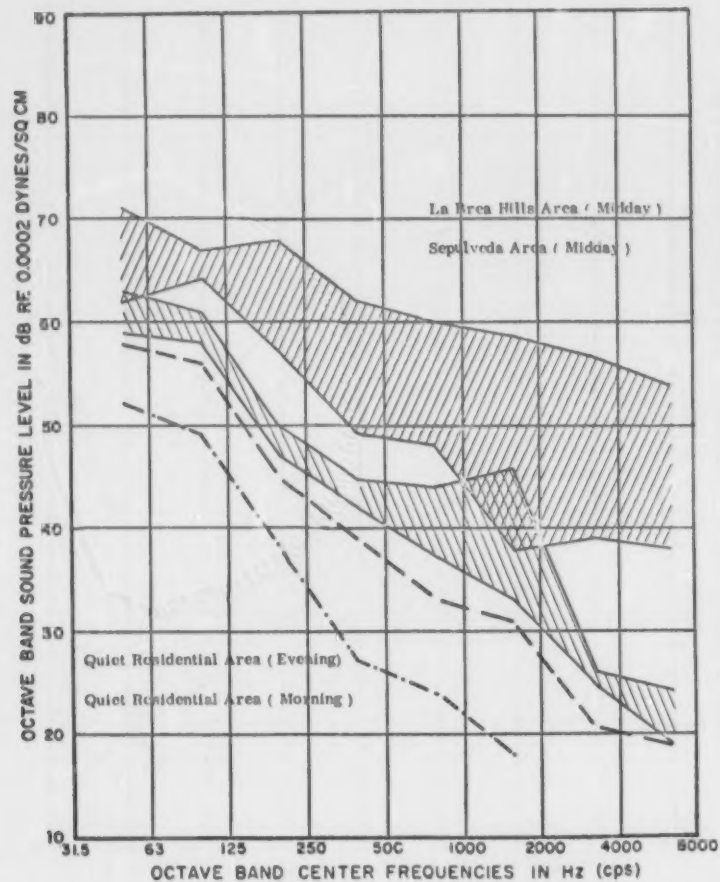


FIG. 3 REPRESENTATIVE BACKGROUND NOISE LEVELS IN LOS ANGELES RESIDENTIAL AREAS, 1955. (Ref. 244)

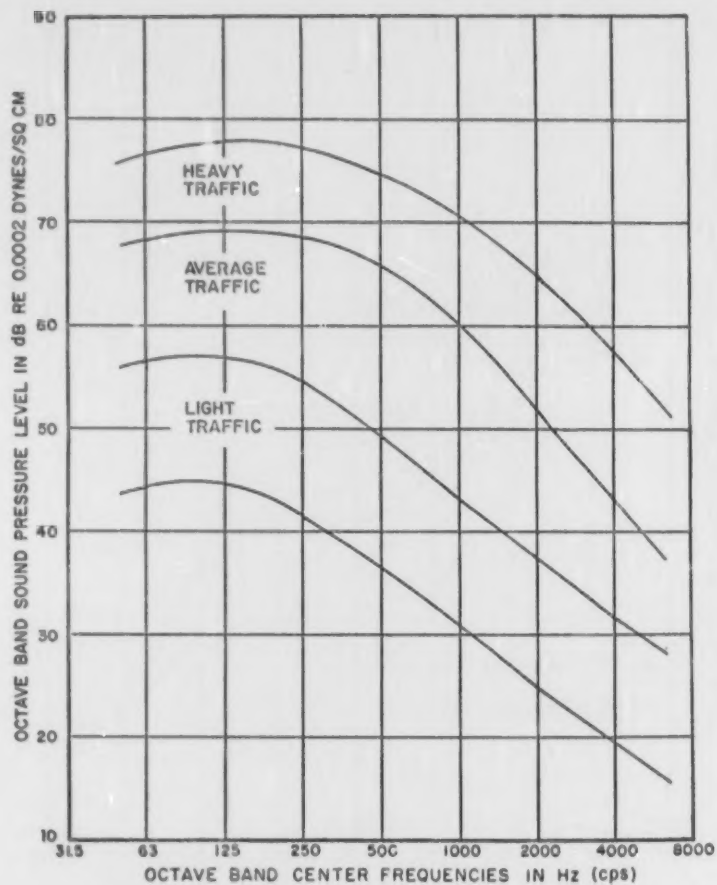


FIG. 2 NOISE OF CHICAGO STREET TRAFFIC, HEAVY, AVERAGE AND LIGHT, 1947. (Ref. 242)

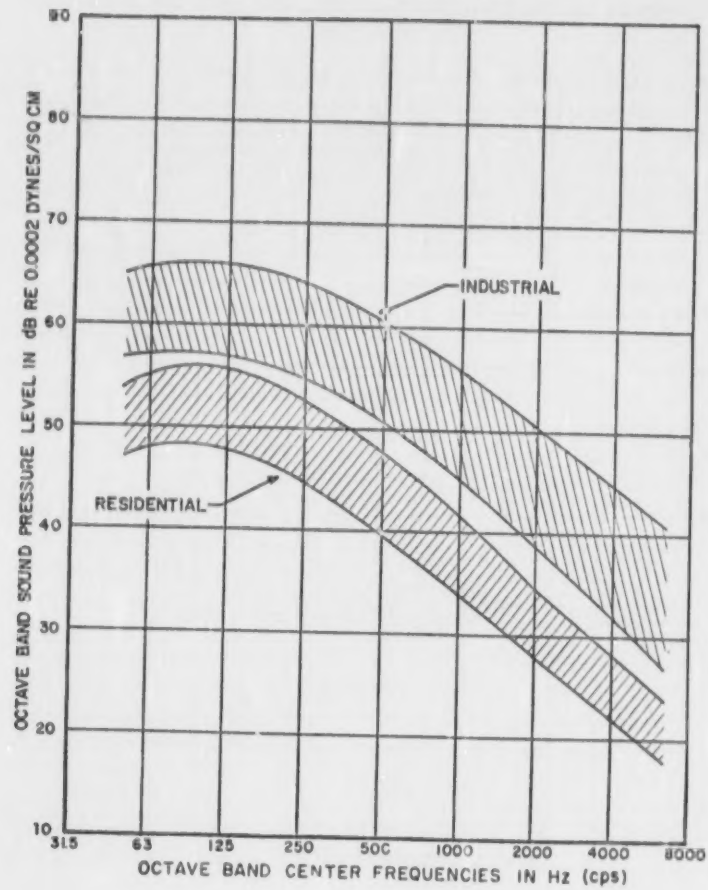
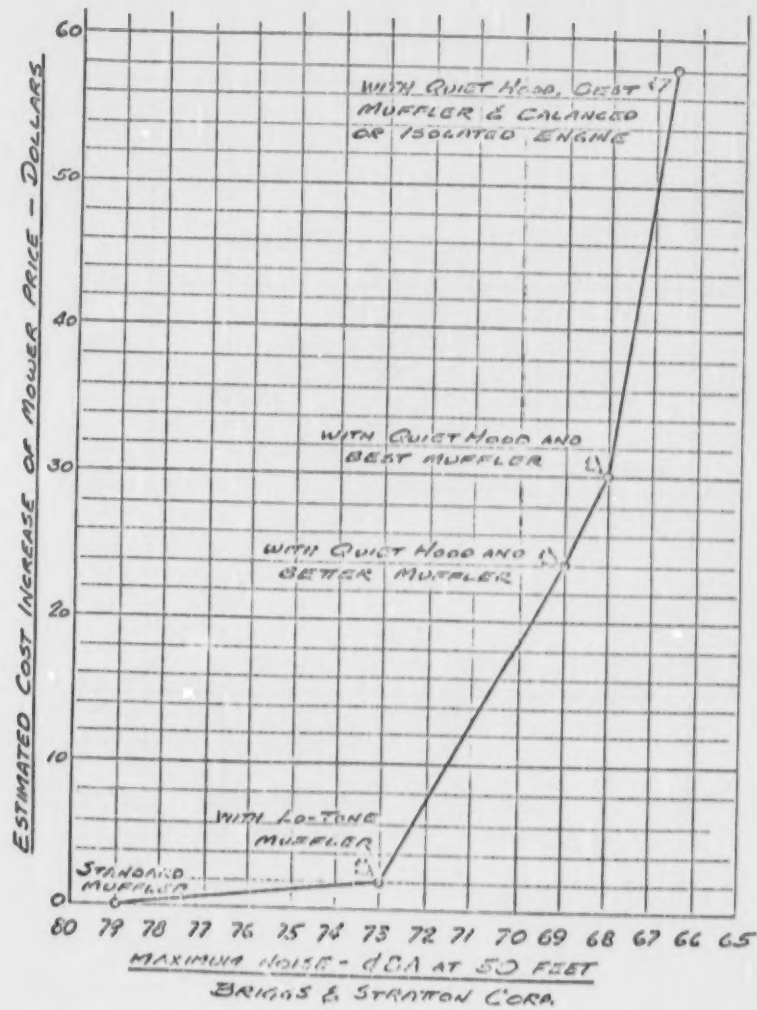


FIG. 1 NOISE OF CHICAGO INDUSTRIAL AND RESIDENTIAL TRAFFIC, 1947. (Ref. 242)

INCREASE IN SELLING PRICE OF A 6 HORSEPOWER
RIDING MOWER WITH NOISE REDUCTION TREATMENT



forty years. Among my clippings about noise I find one from the Los Angeles Times dated September 2, 1927. The title reads "Noise Said to Shorten Life-span", and the subtitle "Dr. Knudsen of UCLA Declares Everlasting Din One of America's Banes". The first sentence reads: "Americans today, to a large extent, are paying in a shortened tenure of life, and reduced efficiency, for the noise amid which they must work and live."

About five years ago, Victor Gruen—distinguished architect and urban planner—coiently and pithily declared: "Noise and Smog are Slow Agents of Death." Unless we arrest the relentless and monstrous growth of smog and noise in the metropolitan environment, Victor Gruen's slogan can be revised to read: "Noise and Smog are Sure Agents of Death."

In 1954, on the occasion of the twenty-fifth anniversary of the founding of the Acoustical Society of America, I reminded acousticians and the public that during the preceding twenty-five years the loudest noises to which man was exposed had increased 25 decibels, from 125 to 150 dB(C) [about 110 to 135 dB(A)], an average of one decibel per year. I further reminded them that if this rate of increase continued for another 25 years, noise would reach a maximum level of 175 dB(C) [about 160 dB(A)], which probably would be lethal for man. Already in 1954, it was known from researches of Dr. I. Rudnick, now President of the Acoustical Society of America, that a noise level of 165 dB(C) [about 151 dB(A)] was lethal for cockroaches and rats.

The loudest noises to which urban man is presently exposed are generated by aircraft. Although motor vehicles are still the most ubiquitous contributor to urban noise pollution, aircraft noise is increasing at an alarming rate. An article in the February 1970 issue of Scientific American reports that from 1936 to 1963 the take-off noise from civilian aircraft increased from about 100 to 130 dB(C), thus continuing its inexorable rise of at least one decibel per year.

This comprehensive study and report by Dr. Branch—an authority on planning of the highest rank—and his graduate student collaborators contribute importantly to our knowledge of growing urban environmental noise pollution. The literature linking outdoor noise and urban planning is very sparse. Furthermore, based on his extensive city planning experience in Los Angeles, Dr. Branch makes relevant and realistic recommendations for noise standards and governmental actions which would insure the safety, benefits and amenities resulting from communities free of noise pollution.

Achievement of the noise environment which would result from the standards and actions recommended in this report will take time. In the meanwhile, I urge sensitive and sensible persons who are disturbed by noise to obtain temporary relief and protection by wearing ear plugs (Mine Safety Appliances Ear Defenders, Willson Sound Silencers, or equivalent). These can reduce noise by about 30 dB; a harmful noise level of 90 dB(A) is reduced to a tolerable 60 dB(A). Many people routinely wear dark glasses to reduce sun glare. Those bothered by noise should wear ear plugs.

It would be a tragic error, however, to tolerate growing urban environmental noise or excuse noisy manufactured products because ear plugs can be worn. This would be like ceasing to concern ourselves with smog because gas masks are available. Not only are our natural senses further dulled when artificially filtered or masked, but if we are to adjust in this way to our environment as it is trending, we will be wearing ear plugs or muffs, nose masks, lead foil underwear, a biologically and chemically protective over-garment, and, of course, our dark glasses.

Vern O. Knudsen
Professor of Physics and Chancellor, Emeritus
University of California, Los Angeles

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Allis-Chalmers Corp., Harvey, Ill. 60426.
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Cummins Engine Co., Inc., Columbus, Ind. 47201.
Deere & Co., Moline, Ill. 61265.
General Electric Co., Erie, Pa. 15601.
Detroit Diesel Allison Division, General Motors Corp., Detroit, Mich. 48228.
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 Teledyne Continental, Warren, Mich. 48093.
 Teledyne Wisconsin Motors, Milwaukee, Wis. 53246.
 Waukesha Motor Co., Waukesha, Wis. 53186.
 White Engines, Inc., Canton, Ohio 44702.
 Dr. MEYER. Very good. Proceed, please.

**STATEMENT OF JONATHAN T. HOWE, LEGAL COUNSEL,
 ENGINE MANUFACTURERS ASSOCIATION**

Mr. HOWE. My name is Jonathan T. Howe. I am a lawyer with the law firm of Jenner & Block, 135 South La Salle Street, Chicago Ill. I appear here today as legal counsel to the Engine Manufacturers Association and, as with Mr. Young, at the invitation of Dr. Alvin Meyer. In my capacity as legal counsel to EMA, I have, as some of you know, devoted most of my professional time to the myriad of problems surrounding the legal control of air pollution, noise and of the environment. As Mr. Young has testified, EMA has been called upon to give technical and legal assistance throughout the United States and Canada on laws and regulations applicable to the control of emissions from internal combustion engines.

My testimony, just as Mr. Young's, is only on behalf of the engine manufacturer. It is not and should not be viewed or interpreted as being a consensus opinion of the engine industry or of those customers of the industry.

AREAS OF CONCERN

We appreciate the opportunity to appear before this panel again, having given testimony at the San Francisco hearings. It may be of some value, because the composition of this panel is somewhat different from that of the San Francisco panel, to review some of the areas which I discussed in San Francisco in that they must provide the foundation for any effective program to legally control noise emissions. Today I want to discuss three areas:

(1) The need for objective standards which are achieved by a balancing process which takes into consideration the relative position of all parties, and as common law precepts have clearly demonstrated, an approach which has the capability of protecting the interests of all.

(2) A review of the arguments for and against the need for uniform standards, not only as to any noise standards, but also as to uniform test procedures and enforcement methods which will be used to enforce the standards which may be adopted.

(3) A review of certain legal constraints which are placed upon the manufacturers to work cooperatively in the area of research and development to improve the environmental aspects of products which they make.

First of all, what is noise?

When we use the term "noise" we are talking about "unwanted sound" which is a very subjective definition in itself. What may be music to a teenager may be noise to the parent. Typically, judicial definitions of noise have also been very subjective. In one case, the court stated:

Noise includes loud, confused, or senseless shouting, sound or a sound that lacks an agreeable musical quality or is noticeably loud, harsh or discordant, any sound that is undesired or that interferes with something to which one is listening, or displeasing sound.

Indeed very subjective.

The legal history of noise control may be of interest to you.

In San Francisco, I traced the history of the law, insofar as it related to attempts to control or abate noise. It might be worth while, so that you may properly appreciate the first concern that I have as a lawyer, that of a balanced approach with objective standards, that I quickly review some of that testimony today, with the idea being that this is repeated for understanding, and hopefully not for boredom.

Anyone working in the environmental field the last 3 years cannot help but notice in the field of environmental protection, more so than in any other area, technological advancement has always been ahead of any legal control placed upon that advancement. Between the extremes of unfettered technology and an overbearing restrictive policy upon that technology, the law must strike a balance. A balance which allows technological advancement but one that gives adequate consideration to its consequences tempered by a deeper concern for the interaction between man's tools and the human environment in which they do their work.

The law has attempted to control noise through two different approaches—(1) Common law and (2) statutory or regulatory enactment. Under the common law three basic theories have been used by the courts. These are the nuisance, the so-called inverse condemnation, and the direct physical injury concepts.

In turn, statutes and regulations have been of three types—(1) Subjective standards resulting from the codification of the nuisance approach of the common law; (2) an objective or quantitative standard establishing specific sound levels most likely in terms of dba and measured by certain, specific methods; and (3) laws prohibiting noise or limiting the extent or location of use of sources of noise.

The law has traditionally used a subjective means for purposes of controlling such things as noise. However, other methods dating back to antiquity have been used to control noise. By popular decree, the Romans enacted a prohibitory noise law which forbade the movement of chariots in the streets of Rome between sundown and sunrise.

One of the first reported court decisions which I have been able to find is dated in the thirteenth century. Since then, under the common law, excessive and repeated noise has been recognized as a common law nuisance. If a court was convinced that the nuisance was substantial and resulted in harm or damage, it would award damages to the plaintiff and injunctive relief prohibiting the furtherance or continuance of the noise found to be a nuisance.

A review of the common law methods, however, discloses that as presently used, these methods are inadequate to achieve national goals of a quieter environment.

Taking each of these common law concepts in turn, and directing my attention first to the nuisance doctrine, this is a very

subjective approach to the problem. In noise nuisance cases, the courts have been required to reconcile the conflicting interests of property owners—one who wants to enjoy his without annoyance and the other who wants to use his for whatever he wants.

One legal writer noted that two major principals have evolved. (Spater, Noise and the Law, 63 Mich. L. Rev. 1373, 1375 (1965)):

First, each person must put up with a certain amount of annoyance, inconvenience, and interference.

Second, in determining the amount of annoyance, inconvenience and interference that must be tolerated, the gravity of the harm to the complainant should be weighed against the utility of the conduct of his troublesome neighbor.

Judges necessarily have attempted to strike a balance between the rights of individuals and the rights of society in general. Sometimes this means invoking the wisdom of Solomon and dividing the loaf between the parties.

In one case, *Firth v. Scherzberg*, the Supreme Court of Pennsylvania held that the operation of unimproved land for a tractor-trailer truck terminal was not a nuisance per se, that is, a nuisance in itself. The operation of the terminal was considered by the Supreme Court of Pennsylvania to be a nuisance only at night from 8 p.m. to 7 a.m. It thusly modified the order of the trial court prohibiting the use of the terminal at any time. The supreme court stated the legal test as being:

Noise which constitutes an annoyance to a person of ordinary sensitivity to sound, so as to materially interfere with the ordinary comforts of life and to impair the reasonable enjoyment of his habitation to him, is a nuisance.

It should be noted that the court stated its test in terms of a person of ordinary sensitivity to sound. As has been noted in the testimony that has been given to this panel, there are people whose sensitivity to sound is in all ranges of the spectrum. The court wisely decided that those of "ordinary sensitivity" should be the test to determine whether there is a nuisance.

There are many other decisions based upon noise as a nuisance which warrant consideration and which give us valuable lessons in noise control, but time prevents us from doing so now.

The doctrine or remedy of inverse condemnation is a relatively new and obscure one which has been created by judicial decision. It is based on the concept that a person's real property rights are adversely affected by some governmental body and therefore are "taken" without just compensation, even though no formal exercise of the power of eminent domain has been attempted by taking agency. This method is limited to governmental bodies which must be the defendant and there must be substantial damages in real property which may be measures.

I might add parenthetically that the concept that undue noise and air pollution decreases property values is fairly well established in eminent domain cases. In numerous cases, the courts have held that compensation may be awarded for such lessening in value.

An example of an inverse condemnation was the decision of the Supreme Court of Oregon in *Thornberg v. Portland*, 376 p. 2d 100 (Sup. Ct. Ore. 1962). This was an action brought by property owners against the operators of the Portland Airport. The court upheld the rights of the landowner to be compensated for the lessening of the value of his property from excessive

noise resulting in the operation of the airport, and which had in turn the effect of depriving the landowner of the useful possession of his property, even though a condemnation of the property occurred through eminent domain proceedings.

The last of the common law approaches is that of physical damages which is very similar to the nuisance concept. There have been some unique decisions in this area which requires actual physical damage to the property of the plaintiff, with the same or similar requirements for recovery in an action based upon negligence.

As these representative cases show, common law remedies based upon subjective standards are not the answer. In each situation, the case was required to be decided on its own merits through a lengthy trial. However, the lessons learned from the balancing approach used by the courts in determining the issues involved in each of the common law cases is of substantial importance.

Turning next to statutory and regulatory approaches to the problem, we note that each State, with the exception of Alaska, has adopted some legislative or regulatory scheme for the legal control of noise emissions, either directly or indirectly, from motor vehicles. In 1969, the Department of Commerce's panel on noise abatement examined State and local ordinances concerned with noise control. This study noted that vehicular noise control in 32 States was limited to muffler requirements. In 17 States and the District of Columbia, the basis of noise control was a subjective "disturbing the peace" approach with some objectivity occasionally interspersed by the regulation or statute setting specific noise standards. Other methods limiting or prohibiting noise sources have been adopted in several States.

In 1969, only three States had specific noise standards, with regulations, imposing criminal penalties for noise measured at prescribed distances from noise sources. Since 1969, however, many States, in response to the need for some legislation, have been enacting laws and regulations in a never-ceasing pace. The exhibit attached to the testimony in San Francisco, summarizing proposed legislation and regulations, clearly demonstrates the disparity between proposed standards and approaches taken by the various States.

What are the suggestions that we would like to make to the panel today? First, turning to the concept of a balanced standard, as I testified in San Francisco, one of the most important considerations and recommendations that his panel can make, is to encourage the promulgation of balanced standards applicable to engines. Standards should be balanced between the concerns for the environment with the benefits of technology. The establishment of fair and equitable standards, with technological and economic feasibility being a major factor to be considered on an increasing basis as health or medical considerations decrease will be to the benefit of all.

Such standards should take into consideration their effect on other environmental areas such as what effect they will have on air pollution standards, what effect they will have on safety standards.

The question of preemption has been one that this panel has been plagued with since it began its hearings. In San Francisco, EMA also presented a summary of various State and local noise regulations which are being proposed and which in some cases have already been adopted.

This plethora of State and local statutes or regulations clearly demonstrates the inconsistency and chaos that exists in the rapid scramble to get something on the books.

For example, in some States using dbA ratings at 50 feet, standards are anywhere from a low of 74 to a high of 90 dbA. Connecticut has been considering standards based on 25-foot limits.

Even more confusing is the lack of any consistency in enforcement methods. Some local governments, having passed standards, have failed to adopt any enforcement procedure to go with the standards.

EMA certainly recognizes the need for effective legal control of noise emissions. Standards and laws which are easy to understand are equally easy to enforce.

Uniform enforcement procedures in the noise area, because of the various methods presently being advanced, should necessarily be established to assure compliance with uniform noise standards. We, therefore, most earnestly support uniform Federal standards and enforcement procedures with Federal preemption, if preemption is the only way that uniformity can be obtained. Also, because of the variances in test method, we would respectfully submit that a uniform procedure be established under the aegis of one Federal Government agency, preferably the Environmental Protection Agency. This Agency, in turn, should be given the authority to delegate responsibility for enforcement of noise standards applicable to engines to State and local governments which adopt identical plans in accordance with the uniform procedures established by the Federal Government.

We take no position at this time on local standards affecting the operation of motor vehicles or of engines themselves on a local basis.

Opponents to uniform standards, or preemption, have expressed in their opposition the concept that only the State or local government can do the job effectively. While this impassioned plea has been expressed with great eloquence, I must submit that its adoption could well result in the opposite result, that is, the total failure of the law to control noise emissions from engines. It is also, I submit, not accurate when one considers the work of EPA in air quality improvement.

And here, too, parenthetically, I think it important to point out that with all due deference to my colleague from the State of New Jersey, where he made reference to the air pollution standards which are in force in the State of New Jersey, I would hasten to point out that those standards insofar as they are applicable to diesel motor vehicles are identical to the Federal standards presently in force and promulgated under the Air Quality Act of 1967. Those standards, while they have variance in the language, when you come to the measurement procedures and the methods by which they are enforced, are identical to

the Federal standard. And thus we find that the State of New York also has a similar or identical standard to that of New Jersey as well as identical to that of the Federal Government.

So I think that the concept of Federal standards and uniform standards is one that we have seen demonstrated, and the ability for these standards to do the job effectively has most clearly been demonstrated in the air pollution area, and certainly under theegis of the Environmental Protection Agency.

There are numerous reasons in support of preemption or uniform standards and enforcement procedures. Most manufacturers of internal combustion engines use mass production techniques, resulting in the economic production of high quality engines. Mass production techniques will assure the continuation of the economic growth of this Nation. This well could be lost if each State and local authority was permitted to establish varying standards which are not identical.

In my San Francisco testimony, I also noted that the immediate ecological needs of the Nation could be met more effectively by having only one agency charged with the responsibility in the establishment of noise standards and enforcement procedures. Having a single agency responsible is particularly helpful when you consider the critical shortage of qualified technical experts in the area of noise technology. No State or local government could economically assemble the technical expertise which must be applied to effectively and rationalistically control noise. A single Federal agency would result in a greater cost-effectiveness and would result, we feel, in improved and better standards which could be adopted more quickly than if this tremendous, complex task was left to a multitude of agencies or State or local governmental bodies.

Parenthetically I would state again I have listened to testimony in these hearings and elsewhere concerning people who desire to see no preemption established so that the State may set a more stringent standard. But nowhere have I heard any testimony given by any of these people who claim that they need to have more stringent standards, that they have the capability to promulgate such standards, the technological expertise to properly establish these standards, and the ability to enforce a more stringent standard.

And I think also, most importantly, we heard in the testimony this afternoon, both the testimony of the gentlemen from Florida and from New York, that the funds necessary to do an effective job are also not available.

Because of the high mobility of engines, States and their political subdivisions cannot effectively solve noise emission problems by merely regulating those engines which are initially registered in that State. Conflicting requirements in various States or localities attempting to regulate noise will result in confusion, and rather than helping to control the problem, lead to further delays and difficulties in the implementation of effective and realistic noise standards and enforcement procedures.

A thorough understanding of any law is always essential for its effective enforcement. By permitting confusing and conflicting noise standards, it would be, in our opinion, near impossible for

the public to understand and difficult for the industry to respond and comply with such standards.

I would also submit that it is important that only one agency within the Federal Government itself be charged with the responsibility for the promulgation of standards. Presently we have standards being established by the Department of Defense, the Department of Transportation, the Environmental Protection Agency; pursuant to the Walsh-Healey Act, the Department of Labor Occupational Safety and Health Safety Act. We have a multitude of standards which are being proposed; ideally here, too, the same arguments which rationalize and support the concept of preemption of State Governments and local governments from enacting standards apply to activities within the Federal Government.

Turning lastly to the concept and the problem that we have been asked to address ourselves to, is that of industry cooperation. We have been requested by the panel to address ourselves to the subject of cooperative effort among engine manufacturers to reduce engine noise. The law is uncertain at the present time as to the circumstances under which joint research efforts and exchange of data are permissible. Bills have been introduced in both the Senate and House to permit coordination and cooperation in accelerated research and development of devices and equipment to meeting government standards for motor vehicle exhaust emissions and in the abatement of air pollution. Neither S. 2258 or H.R. 9952 consider such cooperative efforts in the area of noise abatement and control. EMA, therefore, does not sponsor such cooperative activities because of the uncertainty, although that policy could be reconsidered in the event of further developments clarifying this situation.

I thank you for this opportunity to speak to you. Again, let me emphasize that the Engine Manufacturers Association is ready to assist and work with you in any way possible to effectively provide the framework and method by which noise in our environment can be reduced. With reasonable and enlightened standards and procedures we can both enjoy quiet and technological advancement.

Dr. MEYER. We appreciate this very fine statement. I will ask the panel if they have any questions before I go ahead. Dr. Dietrich.

Mr. DIETRICH. Yes, I have one question for Mr. Young. It has to do with an item in your statement on page 2, and I just want to make sure that I have not misinterpreted this. At the bottom of the page you say that those familiar with research and development activities know that many solutions cannot be applied in the marketplace since the costs exceed those of methods or products in use, and I am just wondering whether I am to take that statement to mean that any additional noise control on a product would have to be at no additional cost before it would be acceptable to EMA.

Mr. YOUNG. Dr. Dietrich, I didn't intend the statement to say that, and I don't think it says that. But what I am trying to say is that if cost is not a consideration there are many technological improvements, innovations in both products and processes which

can be done. Generally as technology develops the first breakthrough in a technological solution is made without any consideration of cost parameters; and then the next step comes to try to take that technology and bring it down to where it either provides a better product than the existing product it is going to supplant at the same cost or provide a better product at higher cost, or a lower cost new way of doing it.

Am I communicating? I am saying—

Dr. DIETRICH. I think I understood your later statements to be really very thorough analyses of the amount of consideration that has to be given to this cost aspect, and I was just concerned that when I read this earlier statement it didn't in my mind jog with that, and I thank you for the clarification.

Mr. YOUNG. For example, maybe to clarify my point, you know, we can spend \$10, \$12 million to go to the moon if we want to, but that is where we decided that other objectives were more important than cost parameters. And there are a lot of technical solutions that you can place in the marketplace, so it is a general statement.

Mr. DIETRICH. I guess it just means that we decided the benefit was worth the cost. It was a very large cost.

Mr. YOUNG. Right.

Mr. DIETRICH. My next question might be directed to either of you. In listening to your qualification at the beginning with respect to the role of the Engine Manufacturers Association I would like to ask whether you believe that engines themselves will ever require or should be subject to specific Federal noise limits or do you believe that the limitation on engine noise will come about through an internal process which includes the users of the engines and which reflects Federal limitations that are applied to completed equipment?

Mr. HOWE. That is the chicken or egg approach to the problem. From the standpoint of our role and the extent to which we feel comfortable in rendering any testimony both from a practical and a legal standpoint we necessarily have to limit our remarks to what we consider best in the interest of not only the public, but of the engine manufacturer, with a small "e" and small "m."

Our feeling is that probably just as in some other areas, the engine is only a part of the problem. There are many other aspects that have to be considered. The end use product or the extent to which the engine is placed into other applications than just being used as an engine is something that people such as those from the construction industry equipment association or farm implement or automobile manufacturers, or so on, are better qualified to discuss than either Tom Young or myself.

Mr. YOUNG. The practical problem, as you recognize, is that a noise source is a component part of some other piece of equipment, and from the abatement and control standpoint the desire is to control the total piece of equipment.

Mr. DIETRICH. I understand you recognize that role that the engine plays as one of the noise sources in what may be a multiple source piece of equipment, but I wondered whether you thought that some effective useful gain could be gotten out of a

Federal regulation that controlled engine noise as a component as opposed to merely letting it fall upon you in the due course of control of the complete equipment of which your engine is only a part.

Mr. YOUNG. Well, Dr. Dietrich, I think you have some knowledge of the extremely complex problem of taking a vehicle, a truck or piece of construction equipment, and attempting to reduce its total noise emissions. And if you are going to select an engine or any other component out of that total piece of equipment and set standards for it you are going to hamper the potential improvements that the design people can make, because as you know, if we lower the noise of a vehicle 2 decibels, then another component comes up—the total vehicle noise comes from the fan, from the exhaust, from the intake, from several sources. And it seems to me to be very difficult to consider establishing a standard on a component of that vehicle when the objective is really to lower the noise of the whole vehicle. Let industry innovate how to get the total vehicle down and I think you will end up with better abatement.

Mr. DIETRICH. Well, I think I understand your answer to be a rather straightforward "No" to the suggestion that engines should have a limit imposed on them.

Mr. YOUNG. Right.

Mr. HOWE. I think the question becomes what is going to be the most effective means, and as Dr. Meyer mentioned, and others mentioned, you could take a truck and not even have the engine on it and roll it down the hill and you will have approximately in some situations the same amount of dbA level just from tire noise and wind noise and other aspects that come into play with the engine not even being on. So it is a total problem.

Mr. DIETRICH. I think we all understand the multisource aspect of it.

My last question is directed to Mr. Howe, and it has to do with this preemption issue once again, and I am just going to make a short hypothetical question to you in which I will ask you to image that the United States has split in two, let's say, at the Mississippi River, and that those States east have one noise limit for some product that is engine powered and those to the west have another noise limit, both are technologically feasible. The lower limit, which let's say is 5 decibels less, costs more, as you quite properly point out. Would I understand from the basis of what you said in your statement that the Engine Manufacturers Association would look to its members to forego their right—if that were the situation that I just explained—as manufacturers to choose between the following two alternatives: First, the economies of scale that they might realize from meeting the tightest standard everywhere and selling the same product everywhere, versus the economies of product cost of selling separate market oriented products?

Mr. HOWE. Well, you have another consideration. You have only talked about one element in this whole situation. You have to take in consideration the user as well, beside the manufacturer. Part of the question would be would the user who lives on the one side of the Mississippi River who might have to have a higher

standard go across the river and buy on the other side of the river where he can buy a lesser standard and not pay as much money.

I think maybe that begs your question a little bit, but I think it is an important consideration that has to be made.

Mr. DIETRICH. I was assuming for jurisdictional purposes that control of that sort of thing has been established.

Mr. HOWE. Let's assume we have that also. Looking at your question as to what the manufacturer is going to do, obviously the Engine Manufacturers Association is not going to tell its members what to do, quite to the contrary. In my last little paragraph of industry cooperation that type of situation would not be called cooperation, but I think they have another word for it the Department of Justice calls conspiracy. And I don't think that we would be in a position—obviously just as we have right now with the California situation in the air pollution area, we have a different standard for California than we do for the rest of the Nation in the air pollution emission field for automobiles. And I believe you will find that most manufacturers are meeting a more stringent standard in the California situation and are perhaps continuing to sell the same product outside of the State of California. I can't speak with a great deal—

Mr. DIETRICH. Some are and some aren't. You wouldn't deny even philosophically they had a right to do that, make that choice?

Mr. HOWE. Obviously not.

Mr. DIETRICH. Thank you.

Dr. MEYER. Panel, I will have to call your attention to the fact that we are operating under a time constraint, so one question apiece, anything else in writing.

Mr. ELDRED. I will just make a comment on this. I applaud your recommendation for a national monitoring aspect. But I wouldn't want to think that is coupled with the idea we have to go out and measure our noise before we can set any standards. Thirty decibels for the DC-3's, 707, is probably quite good.

Just one more comment. On the cost side it is always extremely difficult as a manufacturer to estimate what it is going to cost to change any one parameter, and particularly when you are looking at a thing that comes off the end of the production line. The question is what do I do with this, we have a tooling investment, we have to change this in 6 years to make it quieter, and almost always in that situation it must cost more. There is always an added cost.

On the other hand, it has also been my experience that when a new constraint is added in the preliminary design process with sufficient time to respond, then it does not necessarily cost more to come up with something that meets this new constraint.

I think the DC-10 is a very nice example of an airplane that is a little bit bigger than the 707. It turns out that it is 15 decibels quieter than the 707, which adds—

Mr. YOUNG. What was the time frame of its design?

Mr. ELDRED. The time frame of its design was 1966.

Mr. YOUNG. That is 5 years.

Mr. ELDRED. It is a 5-year design. But it is not being bought by the airlines because it is a quieter airplane. It is being bought because it costs less to transport passengers than it does in the 707.

Mr. YOUNG. And it has a small airport capability.

Mr. ELDRED. It is a better airplane for the airlines. So I think you have to look at that cost thing in those dimensions. One shouldn't get frozen in a Band-Aid ad hoc approach.

Mr. YOUNG. I agree with you completely. We may be going too fast, we may be moving too fast by legislation in the air pollution area, 90 percent reduction from a point which was not ground zero, you know. And if we go too fast—testimony yesterday from Cummings Engine Co. showed a very difficult problem, and they attempted to show a cost curve of increasing cost of reductions in decibels, and the important point was that a small reduction could be achieved of 4 to 5 decibels at a reasonable cost, but significant reductions could not.

When you couple that with your comment that if you have the time frame and can design it you are coming around to really the way we feel about it.

Dr. MEYER. Ted.

Mr. BERLAND. It is always a pleasure to speak with fellow Chicagoans even if they are on the other side of the table. I don't know either of these gentlemen.

Two comments and then one question, which I am limited to.

I think I have to point out to you one remark this morning toward my type of activity, that the special interest groups such as this against noise are really also users, and I don't think you can divorce a user from the public because the public are the buyers and users. The fact that the public as users have no choice—have one choice, but if they want to buy a powered lawnmower they have no choice. If they want to ride the CTA in Chicago they have no choice but to ride that bus. The other choice is as you suggest, and I don't think it is so absurd from the statistics of increasing sales of bicycles and hand mowers and other hand equipment that perhaps that is an alternative that people can resort to, as threatening as it may be to industry.

I also was disappointed in your testimony a little bit because I found a great deal of quibbling between nuisance and dbA, which I don't think is the problem. What really bothers me is that you speak for the public and consumer and tell everybody what to do, but you haven't told us what you are doing, and that is my question. We heard yesterday from Pratt & Whitney, Boeing, and other people in aviation as to what they were doing, as frustrating as it may be. But I still don't know what the engine manufacturers are doing towards the end of starting from the beginning and saying well, let's have a lawnmower that is really going to cut grass and do it in an easy way for the man behind it but isn't going to produce noise and bother his neighbors or threaten his hearing. That's what I would be interested in.

Mr. YOUNG. I would agree with your comment that the special interest groups are certainly users; and as I was trying to point out, I don't think that any one of the three particular parties I

mentioned should be in the predominance necessarily, but that all three have a right to be considered.

In terms of what the engine companies are doing, we have some very difficult legal constraints; and speaking to that on a consensus viewpoint, however, you have not been to all of these hearings. Mr. Berland, but International Harvester yesterday tried to tell you some of the things they were doing, and they were setting goals for their equipment and they gave them to you. Cummins provided a very courageous attempt, I think, in terms of their cost analysis, and also rather detailed report of their research and development activities of what they were doing.

Caterpillar has testified in Chicago and Atlanta. Deere Corp. testified in Denver. Outboard Marine and Briggs & Stratton testified in Denver. International I think has testified at five of these hearings.

And so I will let Mr. Howe on the legal side say what EMA can tell you about what the industry is doing, but in terms of companies some things are being achieved.

Mr. HOWE. I think comments have been made by the respective members of this association concerning what they are doing. As a trade association what we are here to try to do is give you some other input as to some thoughts we have in our job to help these companies. They have come in here and testified to this panel all over the country and they have told you what they are doing. I think you have seen right in Chicago what some of these companies have been doing who are or may not be members of our particular association.

But what the industry is doing, I think all you have to do is perhaps listen and review the record that has been presented to this panel and you will find what industry has been doing, what industry has been doing through other groups besides the Engine Manufacturers Association—the construction industry people, SAE in particular, which is made up of many people who are representatives of industry. I think there is a great deal of information which is available on what industry is doing. Industry is not just sitting back. They have been very active in presenting what they have been attempting to do.

In San Francisco we presented a test procedure format which we suggested. We gave you some other input as to consensus types of things which can help and improve the method by which effective legal control of noise can be accomplished as opposed to a helter-skelter approach to the problem which will not benefit anyone.

So I think that perhaps we are all guilty of being somewhat myopic in our approach as to what others are doing or the criticisms that we may hear. I think everybody is working in this area. While you say we sit across the table, let me assure you we have the same desires and hopes to reduce noise substantially within the constraints of technological and economic feasibility that we can, the idea being that we live here, too.

Mr. BERLAND. The point is the Engine Manufacturers Association—I mean aside from separate members I understand and appreciate that the Engine Manufacturers Association itself is not fostering any research into the quiet—

Mr. HOWE. I mentioned in my last remarks dealing with cooperative efforts you have something known as the antitrust laws in this country which prohibit specifically cooperative work in research and development work. One association and four members of the automotive industry entered into a concentricity in 1969 in the State of California based upon alleged conspiracy to reduce to the lowest common denominator research and development in the air of air pollution device development. As a result one automotive company had to go specifically to the Justice Department to seek their permission to take advantage of other research and development that was being done by another member of the industry so that their product could continue to be on the marketplace, and they were fortunate enough to be able to get this approval.

But as far as what EMA is doing, I think if you ask Mr. Meyer you can review our material, we have done the input, we have done the test procedures working with other organizations, working with the States and local governments in this area.

Dr. MEYER. I think the record has to show that that is the case, that there is a real problem. I am sure Mr. Kreml from the Automobile Manufacturers Association is going to have some comments about this tomorrow. It is a complex problem. You would think that the various members could get together and use the association as a vehicle for sponsoring research which would then become available to the total industry. That sounds like a real fine way to do it. Unfortunately, as has been pointed out here, that just happens to violate the Sherman antitrust law.

Mr. BERLAND. In terms of the creation of a proprietary product I think this is true. But seems to me other industries—I think the meat industry is one case in point where the industry came together and financed a separate research foundation that has gone into basic research. That is what I am talking about. I am not talking about the creation of a product.

Mr. HOWE. Well, perhaps it is not appropriate to talk about air pollution work that has been done, but EMA has financed numerous studies with the Southwest Research Institute which have been made available to the States and local governments. EMA runs a rather sizeable research and development budget for special nonproprietary investigations. We are cooperating with SAE. We would hope and wish to be able to cooperate with the Federal Government or other governments which desire our assistance and technical expertise, and hopefully legal expertise, which exists within the industry to assist. We are here today just for that purpose, to assist and provide information and to give you perhaps a tempered viewpoint in this problem.

Dr. MEYER. Before I ask Dr. Johnson if he has a question I would like to ask you one. Recognizing these legal constraints, how can organizations such as the Society of Automotive Engineers, Engine Manufacturers Association, et cetera, be brought together into a sort of cohesive organized effort to deal with a problem that they all have varying degrees of interest and expertise in, but all bearing on the simple issue of how to best control noise. Now from your indepth studies of the problem how can we do this and still stay within the frame of the law? If you

don't have a ready answer I would sure appreciate some thought on this and some recommendations.

Mr. HOWE. Well, as I mentioned, there are presently pending in Congress two bills which would allow cooperative research and development in the area of automotive emissions in the air pollution area. Those bills do not provide for noise. I am not here to advocate either adoption or defeat of those bills, but I point those out to your attention as being a possible means by which this could be done.

I also point out that there is a great deal of uncertainty, that major corporations which are involved in the engine manufacturing business—their legal counsel have taken a very conservative approach to the extent to which even information and data can be exchanged among the various members of these associations because of the ever-present fear of someone bringing an antitrust action against them similar to the situation which existed in California.

I am not here to advocate the repeal or the amendment of the Sherman Antitrust Act, the Clayton amendment to the Federal Trade Commission Act, or any of the other acts applicable in this area, but I do think there can be some type of activity which can be permitted under the present law on a cooperative basis. EMA is working with CRC, working with other groups in the area funding a study. We have a humidity study underway we are funding along with the Automobile Manufacturers Association to determine the extent to which humidity has an effect upon automotive engine emission.

So there are a lot of areas in which we can work. But when we get down to hardware, we get down to devices and things of that nature, in good conscience as a lawyer to this group or a lawyer to any one of our clients who might be in this industry we would have to say no, no, no, because it would just be heading yourself towards a disastrous result.

And even the area I mentioned, this Department of Transportation request, this dealt with international standards as well. There has been some constraint felt upon American industry to cooperate on the development of ISO standards because of the antitrust implications that might arise out of it, so we have an interaction of laws here that we have to try to accommodate as best we can.

One advocate in the consumer field has spoken out very strongly against the two bills which I mentioned which would allow cooperative research. Mr. Nader has on the record been very definitely opposed to these because he feels that competition is most vitally needed in this area as opposed to cooperative research.

So you have two sides of the coin on these things. We don't take a position on these bills. We point them out to your attention. And to answer questions such as Mr. Berland had as to why EMA isn't doing some things, the reason we are not is because we can't.

Mr. MARTIN. Can I just speak for a second on that?

Dr. MEYER. Very quickly, because we have two more witnesses and we have got a 5 o'clock deadline.

Mr. MARTIN. Mr. Howe has covered it very basically, all types of organizations like ours can only deal in basic research. Associations like EMA and AMA will fund this type organizations, even like SAE, will not go into any kind of proprietary development of hardware. But there is a way that could be utilized, and I think it is in pending legislation, and that is through government advisory committees.

Mr. HOWE. This has been used in other areas as well.

Dr. MEYER. I am glad you brought that out. I was sort of fishing for that, but I didn't get what I was fishing for; because there is a way you can set up a technical advisory committee with representatives from both the individual industries and professional and trade associations, and it is one that I was—

Mr. YOUNG. We would think from our experience in that type of group that this would allow you to tap the technical expertise of the industry if they were involved in a formulation of the research and its monitoring much like CRC does, and I believe you are familiar with that.

Mr. HOWE. I think as we have written to you, we stand ready to serve you in any capacity.

Dr. MEYER. Dr. Johnson.

Dr. JOHNSON. I think you have the answer to your question, Mr. Chairman, which I was going to give you that first, but you have it. So I will turn to first of all—it will have to be a comment since I have only one question—that I think you have been unfair, you and some of the people you are representing have been unfair in true cost of reducing noise when you make estimates of 22 percent. And you have already alluded to this sufficiently perhaps, except that I want to say I think the implication was unfair.

My question is one of clarification on a legal matter. I am sure I misunderstood, that the case histories fall in two categories which to me are on the opposite extremes, but the most of our real cases are between—namely, nuisance on the one hand, and damage on the other. Most of our real cases are between these two extremes. Did I misunderstand you in indicating those were the only two references we have, nuisance on the one hand and damage on the other, as far as court cases are concerned?

Mr. HOWE. Well, the legal history, legal control of noise has developed on a common law basis in these areas of nuisance, inverse condemnation and actual physical damage.

Dr. JOHNSON. What is inverse condemnation?

Mr. HOWE. Inverse condemnation is the situation in which there has not been an eminent domain proceeding. Let's take the *Portland* case, *Thornberg* case. There property owners adjoining the airport sued the authority of Portland for inverse condemnation. There was no formal eminent domain proceeding, and they contended in that case that by virtue of the noise that was created by the operation of the airport that this governmental agency operating the airport had in essence condemned their property without paying compensation. However, there was no condemnation proceeding which is necessary under the law by which a governmental body can take property. The condemnation proceeding is one that determines the amount of

compensation that will be paid to a property owner to allow the government to take it.

In the *Thornberg* case and others of similar nature what has taken place there is that the noise has invaded the property and the courts have construed this as being a taking of certain of the property aspects enjoyed by the landowner, and therefore he should be entitled to compensation for the taking by the governmental body.

Dr. JOHNSON. I used the wrong terminology in talking to a lawyer. I should not have said case. I meant situations such as people cannot converse walking down the sidewalk of New York City.

Mr. YOUNG. I would like to comment on your comment about the 22 percent. That was a quotation from testimony of Briggs & Stratton.

Dr. JOHNSON. All I said was I thought they were unfair in making such an estimate. You are unfair in indicating that you thought they were right.

Mr. YOUNG. Well, I do know that Miss Korogry, who is a staff associate of Mr. Meyer's, has said cost will run from 1 to 20 percent, and I don't know whether she is fair or not.

Dr. JOHNSON. Well, I think Mr. Eldred gave you a better example of the way things really work.

Dr. MEYER. It is these differences of opinion that highlight the need for greater indepth investigations into this problem.

Certainly the work of this agency in the last 6½ to 7 months, both in these hearings and preparing the report to Congress, has emphasized what you also said in your statement is a paucity of real world data, and I think I would have to agree that this is one of those situations where everyone may be equally right.

This brings to mind a chart that I have seen before about state of knowledge. You can have a series of points on a curve and so it looks like the trend is going this way, but as you get more and more information the next thing you know, you are getting down here; so you draw a line across in the median and say that is the state of knowledge. But as you keep on testing the doggone thing goes on higher and higher, and it turns out that the first downward trend was just part of a variation in a rising curve.

And so I feel where we are talking about economics in noise control our state of knowledge is rather imprecise. It is also going to be extremely variable in products.

For example, yesterday in the hearings we saw tremendous capital investment by one segment of the aerospace industry. All of us on this panel and out there are quite familiar with the kind of investment that was shown in some of those illustrations. I don't know how you cost some of that into the long term cost; that may be an early point on the curve, and the payoff from that 5 and 10 years later, it may be that you can't even identify those costs in the actual improvement of the product or the cost of the product that is being produced. And, Dr. Johnson, you would agree with that kind of thought, that we don't really know?

Dr. JOHNSON. Yes, sir.

Mr. YOUNG. They would be considered. That's right, we don't know.

Dr. JOHNSON. So we have got to get into this, and that is one of the chores of the Environmental Protection Agency which is clearly and willingly accepted as being a very early order of business.

At this point I would like to go off the record just a minute.
(Discussion off the record.)

Dr. JOHNSON. Now we will go back on the record. Mr. Gebman, if you are prepared, sir—

Mr. GEBMAN. Does each member of the panel have a copy?

Dr. MEYER. Yes, each of us have a copy.

Mr. GEBMAN. What is our time situation, Mr. Chairman?

Dr. MEYER. We have got about 25 minutes.

Mr. GEBMAN. OK, fine. Would you inform me at 15 minutes, please, and then I will go into a 2- to 5-minute wrap-up and that will leave 5 minutes for questions.

Dr. MEYER. Very good. I hate to do this because normally what we have done, as some of the members of the panel and some of the people out in the audience know, was to carry these things until 9 o'clock at night sometimes—with great pleasure, I might add. All right, go ahead, sir.

STATEMENT OF JEAN R. GEBMAN, THE RAND CORP.

Mr. GEBMAN. Members of the panel, ladies and gentlemen, the mechanics of forecasting the community noise impact of a transportation system.

Dr. Meyer has asked me to present this panel with an overview of the noise impact assessment methodology being developed by the Rand Corp. to assist policymakers in evaluating the potential environmental impact of future transportation alternatives.

The growth of the Nation's transportation system plays a key role in the continued prosperity, development, and defense of the United States. However, this growth must be made consistent with requirements for protecting the environment. The problems of both noise and air pollution attributable to transportation systems have already exceeded the tolerance level of a non-negligible segment of our society.

The continued growth of our transportation system without adequate ecological safeguards can result in a significant global deterioration of an already locally critical situation due to the convergence of two factors—the rising demands for transportation brought about by population, economic, and industrial growth; and the introduction of new technologies which offer the potential for improved vehicle performance without appropriate regard for environmental consequences.

Because of these developments, it is now widely recognized that improved methods are needed for planning and regulating our transportation systems. Significant segments of the public are clearly dissatisfied with the environmental effects resulting from the present system of transportation. Local governments, on the other hand, are faced with imponderables such as legal jurisdiction and the forecasting of future transportation requirements.

The problems are further aggravated by the long leadtime required to construct new transportation systems. This last factor has caught many communities at the point where the only near-term solution is to expand existing facilities contrary to a consideration of long-range environmental and even economic factors. Underlying these immediate issues are longer standing ones concerning the adequacy and effectiveness of our advanced planning capabilities. There is a critical need for a coordinated, systematic, and interdisciplinary approach to the problems involving transportation and the environment.

The Rand Corp. has undertaken a major effort to develop systems analysis methodology to confront the mounting conflict between environmental quality and national growth.

As a program within that effort, Rand is developing basic methods for analyzing the impact of future transportation alternatives on the environment. These methods will assist planning agencies in the resolution of complex trade-offs between environmental standards, the operating characteristics of future transportation systems, and the economic cost of those systems to the public. The combined effects of changing technology, the increased purchasing power of the consumer, and the rapidly growing concern for environmental quality have made it imperative that ecological consideration become an integral part of the planning and design of future transportation systems.

The principal objective of the larger Rand effort is to develop methods for the systematic description and analysis of alternate technological concepts that satisfy requirements for national growth and environmental protection. The methods being developed are allowing advanced planners to integrate social and economic objectives with existing and development technology to produce sets of plans that meet the balanced interest of the various elements of the community.

The formulation of acceptable development plans and regulatory policies depend first on a development of methods to provide adequate forecasts of both the demand and types of vehicles which can be reasonably supplied by future technology and their potential impact upon the environment. It is also necessary that the methods allow the planning agency to define and analyze the complex interrelationships among technical, environmental, social, and economic factors and take an account of cost involved in meeting environmental constraints and reconciling conflicting business and public interest. Finally, practical methods must be developed for the implementation and regulation of the plans and policies.

The noise impact assessment methodology development at Rand is presently being sponsored by the Transportation Systems Center of the Department of Transportation. Continued Government sponsorship of the development of methodologies to forecast the potential environmental impact of future transportation systems will contribute substantially to avoiding many of the environmental problems presently confronting society. Methods, such as those being developed at Rand, will also assist the policymaker in formulating balanced criteria and standards for the control and abatement of the present noise environment.

The present Government role in this area is not only limited to the development of methodology. Both the Department of Transportation and the National Aeronautics and Space Administration are sponsoring studies where these tools are being brought to bear on the very important trade-off between the economic performance of future transportation systems and their environmental impact.

The noise associated with a new transportation system will have an impact upon the community which it is serving which is dependent upon the noise environment generated by the transportation system, the community annoyance to noise, and the population distribution within the community relative to the transportation system design.

The effect of the introduction of a new transportation system on a community's noise environment depends upon three factors. First is the noise generation characteristic of the basic vehicles comprising the transportation system. Second is the system design itself, including route and terminal location and number of vehicles using the system. The background noise level, which was present before the new system was introduced, must also be considered in order to realistically assess perturbations in the noise environment caused by the new transportation system of interest.

A community's annoyance to the noise generated by a new transportation system will be governed principally by the difference between the perceived vehicle noise level and the community's background noise level, the duration of the noise associated with the new vehicle, and the number of occurrences of the noise event attributable to the new vehicle.

There has been a proliferation of schemes for describing average community annoyance to a given noise environment. Almost without exception, these schemes have been special purpose in nature, some measures for highway noise, other measures for aircraft noise, and still others for office noise. It was decided that the measure to be used in the Rand noise impact assessment methodology should be common to all the transportation systems to be considered and should be cognizant of the community's background noise environment which would be present before the introduction of the transportation system alternative being considered.

Concerning the advisability of adopting a single common noise measure, it has been noted that if in fact something is to be done about noise reduction across all transportation systems, the measure of the noise level should be common to all systems. In this way, noise levels can be compared, combined, or otherwise treated in a manner which will permit consistent and integrated analyses of the entire transportation system.

The scheme for quantifying community annoyance to a particular transportation noise environment, selected for the Rand methodology, is Robinson's noise pollution level (NPL). This measure is the only demonstrated community annoyance measure which is generally applicable to all transportation modes and is sensitive to existing background noise levels. Robinson's noise pollution level has provided the first bridge spanning the

various gaps between the domains of individual special purpose noise measures. Robinson's measure is based upon the hypothesis that the disturbing character of a complex noise environment is attributable to two factors—the average noise level and fluctuations about that average level. Although NPL results in a single scalar value, as the quantification of a given noise environment, it is, in fact, a two-dimensional annoyance measure. One dimension being the average noise level and the other dimension being fluctuations about the average.

It is important to note that Robinson's NPL implicitly hypothesizes a trade-off between the average noise level and the fluctuations about that average. It was precisely this trade-off hypothesis which allowed Robinson to reconcile the previously contradictory results of the highway traffic noise index (TNI) and the aircraft noise and number index (NNI). The TNI is basically a fluctuation measure and the NNI is primarily an averaging measure. The aircraft NNI correlated very poorly with annoyance data for highway noise and the highway TNI correlated very poorly with annoyance data for aircraft noise. Robinson's NPL very nicely combines the concept of annoyance due to fluctuation with the concept of annoyance due to average noise level and results in a measure which correlates well with both traffic noise annoyance and aircraft noise annoyance, as well as annoyance to combinations of aircraft and traffic noise.

The last element of the community noise impact assessment is concerned with the relationship between the population distribution within a community and the location of the components of the transportation system relative to that population distribution. Previous noise impact assessments have talked about square miles or acres of land exposed to noise in excess of some threshold value on the particular noise annoyance measure scale being used. However, the development of a balanced transportation system providing maximum service at a minimum cost, both economic and environmental, to the community dictates that a more meaningful measure of community impact would be the number of people exposed to a particular noise environment rather than the square miles of land exposed which may or may not have people residing on it. A very complex economic balance must be achieved between the service characteristics of future transportation systems and their impact upon the communities which they are serving.

The cost of abating and controlling the Nation's noise environment will ultimately be borne by the public. The objective of achieving maximum public benefit for the public dollar would indicate that noise impact assessments ought to at least address themselves to the question of how many people are exposed to a particular noise environment rather than merely considering land area.

The mechanics of forecasting the community noise impact consists of, first, specifying the transportation system of interest and then assessing the community impact in terms of the numbers of people exposed to the perturbations in the noise environment attributable to the new transportation system.

The first task is to estimate the vehicle noise characteristics. These estimates are based upon noise level measurements of noise sources on current vehicles, as well as predictions obtained from both empirical and theoretical prediction methods.

The second task is to lay out precisely the latitude and longitude coordinates of the transportation system routeways and terminal locations. The characteristics of the routeway must also be specified, for example, below grade, on grade, or elevated, as well as average vehicle speed for that segment of the route.

The last task under the transportation system specification is the prediction or simulation of the vehicle operations on the transportation system of interest. We now have the necessary technical specification of the new transportation system from which we may determine the community impact. We know how noisy each vehicle is, we know the route and average speed of the vehicles, and we know the number of vehicle operations along the various segments of the routeway system.

Given a statement of the background noise levels in the community, before the introduction of the transportation system being considered, we now proceed to calculate contours of equal noise annoyance within the community. The methodology allows the analyst to specify the noise annoyance level for which he desires contours within the community. The annoyance measure presently incorporated in the methodology is Robinson's noise pollution level.

The last task of the noise impact assessment consists of counting the people residing within each of the noise annoyance contours. Very fine grain census data is used to determine the total number of households within each one of the noise contours. The first count census data presently being used allows us to analyze the community noise impacts according to ethnic background, as well as income bracket. The fourth count census tape, which will be available to us shortly, will allow us also to analyze the community noise impacts in terms of age bracket, sex, and several other census attributes.

Dr. MEYER. You asked me to give you a 5-minute warning—this appears to be a good point. Give us about 5, and then we will direct some questions to you. But you go ahead. I want the record to show that your entire statement with illustrations will appear following this.

Mr. GEBMAN. Very good. Thank you, sir.

Let me skip the section on applications. There are two figures in the back which can be looked at later on to understand the application.

There appears to be a broad spectrum of public issues in which the noise impact assessment methodology can contribute to the formulation of balanced policies cognizant of the technological, social, economic, and environmental factors. Consider, for example, the following issues:

(1) Identify those transportation vehicles contributing most to today's urban noise environment. For example, how many household noise impacts are there that are directly attributable to the operation of trucks as compared with aircraft, helicopters or motorcycles.

(2) Having identified those transportation modes contributing to the urban noise environment, now determine what standards must be imposed upon those modes in order for their household noise impacts to come into line with the other transportation modes. For example, what noise standard must I impose upon trucks in order that their household noise impacts come down to the same level as some other transportation mode.

(3) Concerning today's airport noise problem, what must we do in terms of land redevelopment, engine retrofitting, changing of aircraft approach and departure procedures, and closing of airports in order to reduce or eliminate unacceptable household noise impacts associated with this transportation mode.

Application of the methodology to a regional or urban transportation system is only made feasible when the full power of modern day electronic data processing is brought to bear on the problem. Indeed, it would not have been feasible to implement the present methodology as recently as 5 years ago.

As a result of some initial Rand sponsored research, and subsequent transportation systems center sponsored research, we have developed a stable of pilot computer programs and procedures to handle a regional transportation system evaluating the noise impacts of both air transportation modes and ground transportation modes.

Having accomplished these tasks, we will then be prepared to fully exploit the potential of the type of noise impact assessment methodology which I have discussed today.

I am now prepared for questions.

(Full statement of Mr. Gebman follows:)

THE MECHANICS OF FORECASTING THE COMMUNITY NOISE
IMPACT OF A TRANSPORTATION SYSTEM
PREP AND STATEMENT OF JEAN R. GEBMAN,¹
THE RAND CORP., SANTA MONICA, CALIF.—

Dr. Meyer has asked me to present this panel with an overview of the noise impact assessment methodology being developed by the Rand Corp. to assist policymakers in evaluating the potential environmental impact of future transportation alternatives.

I. INTRODUCTION

The growth of the Nation's transportation system plays a key role in the continued prosperity, development, and defense of the United States. However, this growth must be made consistent with requirements for protecting the environment. The problems of both noise and air pollution attributable to transportation systems have already exceeded the tolerance level of a nonnegligible segment of our society.

(a) Problem

The continued growth of our transportation system without adequate ecological safeguards can result in a significant global deterioration of an already locally critical situation due to the convergence of two factors—(a) The rising demands for transportation brought about by population, economic, and industrial growth; (b) the introduction of new technologies which offer the potential for improved vehicle performance without appropriate regard for environmental consequences.

Because of these developments, it is now widely recognized that improved methods are needed for planning and regulating our transportation systems. Significant segments of the public are clearly dissatisfied with the environ-

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mental effects resulting from the present system of transportation. Local governments, on the other hand, are faced with imponderables such as legal jurisdiction and the forecasting of future transportation requirements. The problems are further aggravated by the long leadtime required to construct new transportation systems. This last factor has caught many communities at the point where the only near-term solution is to expand existing facilities contrary to a consideration of long-range environmental and even economic factors. Underlying these immediate issues are longer standing ones concerning the adequacy and effectiveness of our advanced planning capabilities. There is a critical need for a coordinated, systematic, and interdisciplinary approach to the problems involving transportation and the environment.

(b) Rand's role

The Rand Corp. has undertaken a major effort to develop systems analysis methodology to confront the mounting conflict between environmental quality and national growth. As a program within that effort, Rand is developing basic methods for analyzing the impact of future transportation alternatives on the environment. These methods will assist planning agencies in the resolution of complex trade-offs between environmental standards, the operating characteristics of future transportation systems, and the economic cost of those systems to the public. The combined effects of changing technology, the increased purchasing power of the consumer, and rapidly growing concern for environmental quality have made it imperative that ecological consideration become an integral part of the planning and design of future transportation systems.

The principal objective of the larger Rand effort is to develop methods for the systematic description and analysis of alternate technological concepts that satisfy requirements for national growth and environmental protection. The methods being developed are allowing advanced planners to integrate social and economic objectives with existing and development technology to produce sets of plans that meet the balanced interest of the various elements of the community. The formulation of acceptable development plans and regulatory policies depend first on a development of methods to provide adequate forecasts of both the demand and types of vehicles which can be reasonably supplied by future technology and their potential impact upon the environment. It is also necessary that the methods allow the planning agency to define and analyze the complex interrelationships among technical, environmental, social, and economic factors and take an account of cost involved in meeting environmental constraints and reconciling conflicting business and public interest. Finally, practical methods must be developed for the implementation and regulation of the plans and policies.

(c) Government's role

The noise impact assessment methodology development at Rand is presently being sponsored by the Transportation Systems Center of the Department of Transportation. Continued Government sponsorship of the development of methodologies to forecast the potential environmental impact of future transportation systems will contribute substantially to avoiding many of the environmental problems presently confronting society. Methods, such as those being developed at Rand, will also assist the policymaker in formulating balanced criteria and standards for the control and abatement of the present noise environment.

The present Government role in this area is not only limited to the development of methodology. Both the Department of Transportation and the National Aeronautics and Space Administration are sponsoring studies where these tools are being brought to bear on the very important trade-off between the economic performance of future transportation systems and their environmental impact.

II. ELEMENTS OF COMMUNITY IMPACT

The noise associated with a new transportation system will have an impact upon the community which it is serving which is dependent upon the noise environment generated by the transportation system, the community annoyance to noise, and the population distribution within the community relative to the transportation system design.

(a) Noise environment

The effect of the introduction of a new transportation system on a community's noise environment depends upon three factors. First is the noise generation characteristic of the basic vehicles comprising the transportation

system. Second is the system design itself, including route and terminal location and numbers of vehicles using the system. The background noise level, which was present before the new system was introduced, must also be considered in order to realistically assess perturbations in the noise environment caused by the new transportation system of interest.

(b) *Community annoyance to noise*

A community's annoyance to the noise generated by a new transportation system will be governed principally by the difference between the perceived vehicle noise level and the community's background noise level, the duration of the noise associated with the new vehicle, and the number of occurrences of the noise event attributable to the new vehicle.

1. *Measures.*—There has been a proliferation of schemes for describing average community annoyance to a given noise environment. Almost without exception, these schemes have been special purpose in nature, some measures for highway noise, other measures for aircraft noise, and still others for office noise. It was decided that the measure to be used in the Rand noise impact assessment methodology should be common to all the transportation systems to be considered and should be cognizant of the community's background noise environment which would be present before the introduction of the transportation system alternative being considered.

Concerning the advisability of adopting a single common noise measure, it has been noted that if in fact something is to be done about noise reduction across all transportation systems, the measure of the noise level should be common to all systems. In this way, noise levels can be compared, combined, or otherwise treated in a manner which will permit consistent and integrated analyses of the entire transportation system.

2. *Quantification.*—The scheme for quantifying community annoyance to a particular transportation noise environment, selected for the Rand methodology, is Robinson's noise pollution level (NPL). This measure is the only demonstrated community annoyance measure which is generally applicable to all transportation modes and is sensitive to existing background noise levels. Robinson's noise pollution level has provided the first bridge spanning the various gaps between the domains of individual special purpose noise measures. Robinson's measure is based upon the hypothesis that the disturbing character of a complex noise environment is attributable to two factors—the average noise level and fluctuations about that average level. Although NPL results in a single scalar value, as the quantification of a given noise environment, it is, in fact, a two-dimensional annoyance measure. One dimension being the average noise level and the other dimension being fluctuations about the average. It is important to note that Robinson's NPL implicitly hypothesizes a trade-off between the average noise level and the fluctuations about that average. It was precisely this trade-off hypothesis which allowed Robinson to reconcile the previously contradictory results of the highway traffic noise index (TNI) and the aircraft noise and number index (NNI). The TNI is basically a fluctuation measure and the NNI is primarily an averaging measure. The aircraft NNI correlated very poorly with annoyance data for highway noise and the highway TNI correlated very poorly with annoyance data for aircraft noise. Robinson's NPL very nicely combines the concept of annoyance due to fluctuation with the concept of annoyance due to average noise level and results in a measure which correlates well with both traffic noise annoyance and aircraft noise annoyance, as well as annoyance to combinations of aircraft and traffic noise.

(c) *Population distribution*

The last element of the community noise impact assessment is concerned with the relationship between the population distribution within a community and the location of the components of the transportation system relative to that population distribution. Previous noise impact assessments have talked about square miles or acres of land exposed to noise in excess of some threshold value on the particular noise annoyance measure scale being used. However, the development of a balanced transportation system providing maximum service at a minimum cost, both economic and environmental, to the community dictates that a more meaningful measure of community impact would be the number of people exposed to a particular noise environment rather than the square miles of land exposed which may or may not have people residing on it. A very complex economic balance must be achieved between the service characteristics of future transportation systems and their impact upon the communities which they are serving.

The cost of abating and controlling the Nation's noise environment will ultimately be borne by the public. The objective of achieving maximum public benefit for the public dollar would indicate that noise impact assessments ought to at least address themselves to the question of how many people are exposed to a particular noise environment rather than merely considering land area.

III. METHODOLOGY

The mechanics of forecasting the community noise impact consists of, first, specifying the transportation system of interest and then assessing the community impact in terms of the numbers of people exposed to the perturbations in the noise environment attributable to the new transportation system.

(a) *Transportation system specification*

The first task is to estimate the vehicle noise characteristics. These estimates are based upon noise level measurements of noise sources on current vehicles, as well as predictions obtained from both empirical and theoretical prediction methods.

The second task is to lay out precisely the latitude and longitude coordinates of the transportation system routeways and terminal locations. The characteristics of the routeway must also be specified, for example, below grade, on grade, or elevated, as well as average vehicle speed for that segment of the route. The last task under the transportation system specification is the prediction or simulation of the vehicle operations on the transportation system of interest. We now have the necessary technical specification of the new transportation system from which we may determine the community impact. We know how noisy each vehicle is, we know the route and average speed of the vehicles, and we know the number of vehicle operations along the various segments of the routeway system.

(b) *Community impact assessment*

Given a statement of the background noise levels in the community, before the introduction of the transportation system being considered, we now proceed to calculate contours of equal noise annoyance within the community. The methodology allows the analyst to specify the noise annoyance level for which he desires contours within the community. The annoyance measure presently incorporated in the methodology is Robinson's noise pollution level.

The last task of the noise impact assessment consists of counting the people residing within each of the noise annoyance contours. Very fine grain census data is used to determine the total number of households within each one of the noise contours. The first count census data presently being used allows us to analyze the community noise impacts according to ethnic background, as well as income bracket. The fourth count census tape, which will be available to us shortly, will allow us also to analyze the community noise impacts in terms of age bracket, sex, and several other census attributes.

IV. APPLICATIONS

The community noise impact assessment methodology can be used to determine the environment impact of future regional transportation system alternatives. Consider, for example, that we are considering five different future transportation alternatives. Let us hypothesize that the results of the noise impact assessment analysis are as indicated in figure 1. Let us say that we consider a household as a noise impact of the transportation system being considered if that systems operation breaks an agreed upon threshold value on Robinson's NPL scale. Let us not count households already exposed to background noise environments which already break that threshold value. We will therefore be talking about the incremental increase in household noise impacts attributable directly to the introduction of the new transportation system. In figure 1, then, we compare the incremental impacts of the various systems being considered. We observe that system D has a very high household noise impact. We therefore ask ourselves, "What must be done to the characteristics of transportation system D such that its household noise impacts are lowered to those of the other systems?"

Using the noise impact assessment methodology, we perform a sensitivity analysis where we vary the noise level standards for the vehicles in system

D. We then find (figure 2) that by making the vehicles in system D comply with a more stringent noise level standard, the total household noise impacts can be reduced to those of the other transportation alternatives. Of course, there are other factors which must be considered such as the technological feasibility of the vehicles in system D meeting that standard, the economic cost to the operator, and the service provided to the users. This little example is intended merely to provide a grossly simplified insight into the mechanics of how the impact assessment methodology is actually applied.

V. POTENTIAL POLICY RELEVANT APPLICATIONS

There appears to be a broad spectrum of public issues in which the noise impact assessment methodology can contribute to the formulation of balanced policies cognizant of the technological, social, economic, and environmental factors. Consider, for example, the following issues.

(a) *Today's world*

(1) Identify those transportation vehicles contributing most to today's urban noise environment. For example, how many household noise impacts are there that are directly attributable to the operation of trucks as compared with aircraft, helicopters or motorcycles.

(2) Having identified those transportation modes contributing to the urban noise environment, now determine what standards must be imposed upon those modes in order for their household noise impacts to come into line with the other transportation modes. For example, what noise standard must I impose upon trucks in order that their household noise impacts come down to the same level as some other transportation mode.

(3) Concerning today's airport noise problem, what must we do in terms of land redevelopment, engine retrofitting, changing of aircraft approach and departure procedures, and closing of airports in order to reduce or eliminate unacceptable household noise impacts associated with this transportation mode.

(4) What can be done to today's freeways and rail right-of-ways in terms of constructing sound barriers in order to reduce the household noise impacts associated with these transportation modes.

(5) For a given budget level, what is the optimal mix of abatement policies which will relieve the most households presently considered to be a household noise impact for the several principal transportation sectors. For example, what percentage of the national resources should go into relieving the airport noise problem, what percentage should go into relieving the freeway and rail right-of-way noise problem, what percentage should go into relieving the truck noise impacts. An optimal noise abatement and control policy for the Nation will single out the principal contributors to the household noise impacts and then focus the national resources according to the potential payoff in terms of relieving household noise impacts.

(b) *Tomorrow's World*

(1) Given a set of future transportation alternatives, what are the relative advantages and disadvantages in terms of the potential household noise impacts.

(2) Given a future transportation system alternative that looks particularly poor relative to its household noise impact, what must be done in terms of vehicle noise abatement and perhaps relocation of the routes involved and terminals in order to attain acceptable household noise impact levels.

(3) What combination of compatible land use zoning and noise abatement for a particular future transportation system results in a minimization of the household noise impacts.

(4) Given that a particular transportation system is going to be installed in a community, what can be done in terms of route and terminal location that will minimize the community noise impact.

VI. METHODOLOGY IMPLEMENTATION

Application of the methodology to a regional or urban transportation system is only made feasible when the full power of modern day electronic data processing is brought to bear on the problem. Indeed, it would not have been feasible to implement the present methodology as recently as 5 years ago.

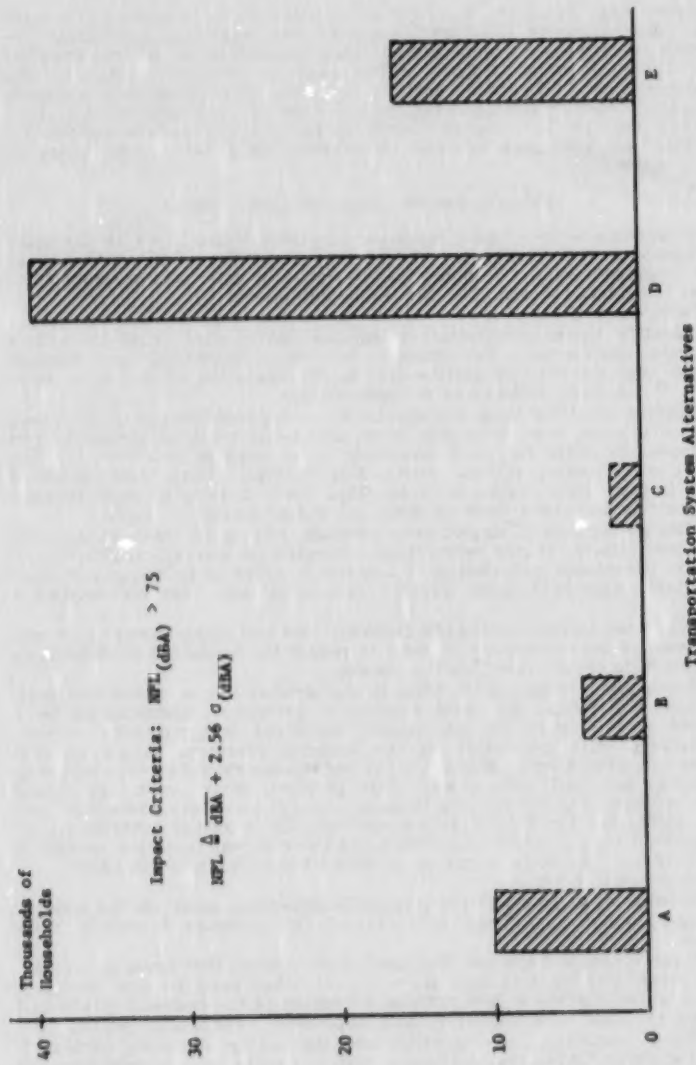


Fig. 1 -- Noise Impacted Households for Five Hypothetical Transportation System Alternatives

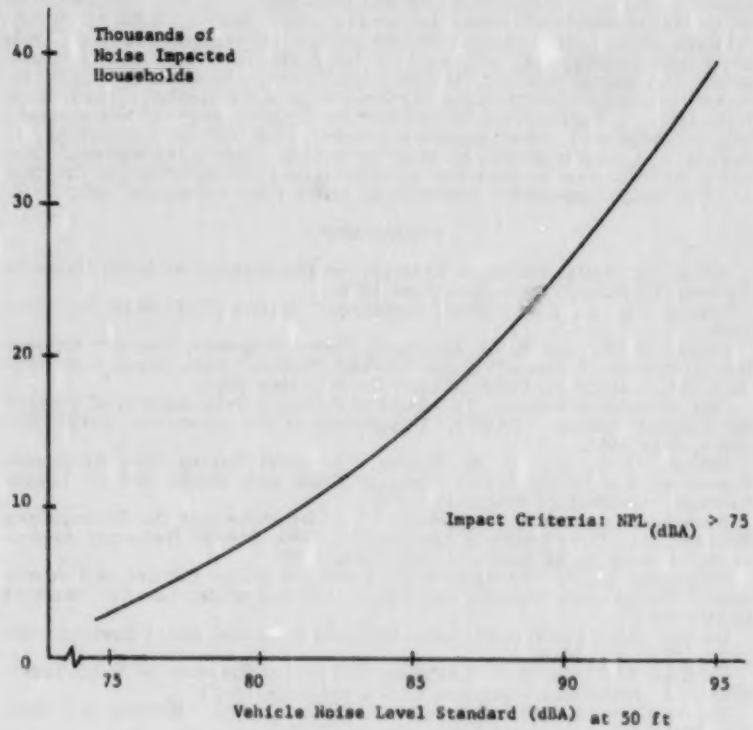


Fig. 2 -- Tradeoff Between Noise Standard and Impacted Households for System "D"

(a) *Present status*

As a result of some initial Rand sponsored research, and subsequent transportation systems center sponsored research, we have developed a stable of pilot computer programs and procedures to handle a regional transportation system evaluating the noise impacts of both air transportation modes and ground transportation modes. The central program, in the present stable of models, is a computer program for calculating Robinson's noise pollution level contours (see figure 3).

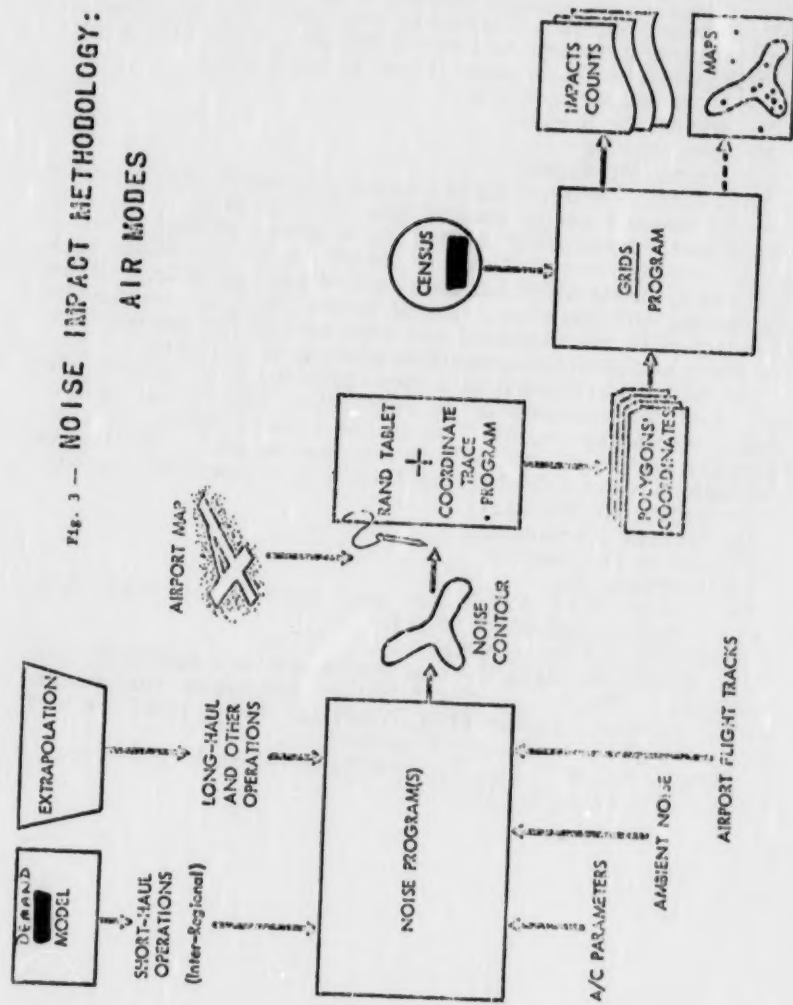
(b) *Desired status*

The successful pilot application to date has indicated that we should press ahead with refinement of the pilot programs, addition of other programs to perform tasks presently executed manually, and documentation of the entire stable of models for general application by government and research organizations. A considerable amount of development work needs to be done in this area, not only in refining and developing computer programs, but also in modifying the basic methodology, reexamining the fundamental concepts of community annoyance to noise, perhaps revision or replacement of Robinson's noise pollution level with a more suitable measure, and the setting of noise annoyance criteria levels for the commercial, industrial and residential sectors, of urban society. Having accomplished these tasks, we will then be prepared to fully exploit the potential of the type of noise impact assessment methodology which I have discussed today.

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Fig. 3 -- NOISE IMPACT METHODOLOGY:
AIR MODES



Wilson, Sir Alan (committee on the problem of noise), "Noise, Final Report," London (Her Majesty's stationery office), July 1963, 235 pp.

Dr. MEYER. Very fine. Thank you very much. And I appreciate your excellent summary. As I say, it will all appear in the record. I will start with Dr. Johnson. Do you have a question?

Dr. JOHNSON. No questions.

Dr. MEYER. Mr. Berland.

Mr. BERLAND. No.

Dr. MEYER. Mr. Eldred.

Mr. ELDRED. I will just make a comment. I would like to correct one impression I get in reading this, that the NPL is the only demonstrated community method. As a matter of fact, there is a very well demonstrated method starting with Rosenblith back in the early fifties which has been applied not only to transportation modes, but also other types of noises, which is very heavily documented in the literature and also used in the international standards as well as noise regulations here in this country.

The NPL unfortunately is a very appealing idea, but it is not very well demonstrated in its application, and it can lead to highly misleading results. This is one idea—I think you come from the west coast—the NPL in a typical portion of the Pacific Palisades is about 5 decibels less than it is in downtown Harlem.

Dr. MEYER. Mr. Martin.

Mr. MARTIN. No comments.

Dr. MEYER. Dr. Dietrich.

Mr. DIETRICH. No.

Dr. MEYER. Well, thank you very much. I appreciate this, and I do want to talk off the record.

(Discussion off the record.)

Dr. MEYER. All right, back on the record very quickly for our concluding remarks. At this point we will recess this session until tomorrow morning at 9 o'clock, at which point we will continue with the scheduled witnesses.

(Whereupon, at 5 p.m., the hearing recessed, to reconvene at 9 a.m. the following day.)

ENVIRONMENTAL PROTECTION AGENCY

PUBLIC HEARING ON THE TECHNOLOGY AND ECONOMICS OF NOISE CONTROL; AND NATIONAL PROGRAMS AND THEIR RELATIONS WITH STATE AND LOCAL PROGRAMS

FRIDAY, NOVEMBER 12, 1971

The hearing was reconvened, pursuant to recess, at 9:25 a.m., Dr. Alvin F. Meyer, Jr., Director, Office of Noise Abatement and Control, Environmental Protection Agency, presiding as chairman.

PANEL:

Theodore Berland, Citizens Against Noise
Dr. John Johnson, Acoustical Society of America
Kenneth Eldred, Wyle Laboratories
Dr. Charles Dietrich, Bolt, Beranek & Newman
Mayor Wes Wise, Dallas, Tex.
Henry Martin, Society of Automotive Engineers

Dr. MEYER. Ladies and gentlemen, I hereby call to order this session of the Environmental Protection Agency's hearing on noise. This hearing is the final sitting of the final hearing, being held by Environmental Protection Agency, in accordance with title IV of Public Law 91-604.

I am Dr. Alvin Meyer, Director of the Office of Noise Abatement and Control, presiding at these hearings for the Administrator of the Agency, Mr. William Ruckelshaus.

These hearings, as we have indicated at previous sessions, are held for the dual purpose of assisting in the preparation of a report to the President, and to the Congress and providing information upon which this Agency will structure its future plans and programs related to noise control.

The Agency and the Federal Government are assisted in holding these hearings by a panel of citizens who are eminent in their fields, and who I will gratefully introduce.

Dr. John Johnson of the Acoustical Society of America and a member of the staff of the State College of Pennsylvania.

Mr. Theodore Berland, president, Citizens Against Noise and author of a text, reference book, "The Fight for Quiet."

Mr. Henry Martin, of the Society of Automotive Engineers. And we will be joined shortly by Mr. Ken Eldred of Wyle Labs, Los Angeles, Calif.

Dr. Charles Dietrich of the firm of Bolt, Beranek & Newman of Cambridge, Mass.

And we are extremely pleased with the presence of Wes Wise, mayor of the city of Dallas, Tex.

Without further ado, we will proceed with the morning's business, and I will ask Mr. Robert D. Cusumano, director of the Nassau County Bureau of Air Pollution, Long Island, N.Y., if he would give us his views.

Thank you for staying. We are glad to see you again.

**STATEMENT OF MR. ROBERT D. CUSUMANO,
DIRECTOR, BUREAU OF AIR POLLUTION CONTROL,
NASSAU COUNTY DEPARTMENT OF HEALTH,
LONG ISLAND, N.Y.**

Mr. CUSUMANO. Thank you, sir.

In the course of these hearings, much has been said regarding the nature and effects of noise. There can be no doubt at this time that environmental noise problems exist and that many Americans are deeply affected. We must inevitably come to the point of decision. What is to be done, how is it to be done, and when is it going to be done are questions being asked by millions of Americans who are becoming increasingly aware of environmental noise. We, in the thousands of local governmental agencies throughout the Nation, are being reminded of this constantly. The local level is the interface between the people of the community, and the environmental noise problems. We, on the local level, deal with environmental noise on a workaday basis, and therefore, are closest to the field of action.

Nassau County, located on Long Island adjacent to New York City, is a union of 69 villages, towns, and cities. The bureau of air pollution control has been responding to an increasing incidence of environmental noise complaints from the 1,500,000 residents of these communities. Our statistics substantiate the findings of national noise study experts that environmental noise and its burden on the community are increasing at an alarming rate. Some of our communities have carried this burden in the form of aircraft noise associated with operations of the J. F. Kennedy International Airport. Other communities are constantly exposed to excessive noise from highways and railroads. Air conditioners, lawn mowers, firehouse sirens, and even barking dogs, are regular villains in the expanding parade of noise problems. The rate of new complaints to our bureau excluding those from transportation sources, has more than doubled each year since 1969.

Our first-line experience in response to environmental noise problems has had moderate success toward attaining corrective action. However, much more needs to be done through the co-operative efforts of all levels of government. These agencies must be well equipped, adequately staffed, and fully motivated.

We believe and strongly urge that the programs to evaluate and control environmental noise be approached from a systems point of view in coordinated intergovernmental efforts utilizing

the technology and resources of industry. It must be pointed out that our society has long ignored this environmental hazard in the production of goods and services. Imposing prohibitive measures would create severe impact on all of us. It would be a fatal oversimplification to stop the airplanes, the motor vehicles, and all the other noise producing sources of our society to achieve peace and quiet. It would not be long before the noise would increase again, but now from the outcry of industry and commerce suffering from a draining immobility.

We must reduce the noise and still keep the wheels turning. How? Let us briefly review a few applicable approaches.

The design and manufacture of low-noise consumer and industrial equipment should be developed by industry to noise standards established by the Federal Government. An extension of these Federal standards could be applied for the guidance of State and local governments in the formulation of their ordinances. This would develop not only the equipment noise requirements, but would assure their compatibility with the particular community requirements. The procedure for the administration of low-noise design and manufacture criteria could be patterned after the current EPA program with the automotive producers. This would facilitate uniform product standards on a national basis. The correction of interstate problems should be directly within the power of the Federal Government. Research and program grants should be initiated and administered by the Office of Noise Abatement.

The State should apply legislation which most consistently meets the unique needs of its local governments and those of its intrastate requirements. Consultation and technical support should be provided to local governments. The State's police power can be exercised to expedite corrective action on intrastate conditions. State codes would further serve as reference for effective enforcement. The State participation would further assure compliance to unique State quality requirements.

Motivated local governments of various disciplines and types must carry the application of standards for equipment and other criteria even further through the zoning, health, and building codes. Local enforcement of regulations should be consistent with State and Federal codes and as in air pollution control, relate these codes to the people.

It must be understood that in many of these approaches, the Federal, State, and local governments must work in the same direction but at different depths. Noise control legislation will require extensive development in order that it be effective and practical. This development will require collaboration by all levels of government and industry. As indicated previously, the Federal, State, and local governments will need to relate in a highly communicative and cooperative relationship. The intimate interface of local government with the community provides an accurate insight into existing conditions and the unique requirements of the people. The State government provides the much needed support to augment programs of mutual interest and to provide liaison from one community to another. The Federal Government would provide the broad scope support and would

define the practical and feasible targets for legislation. In order to be effective, noise control legislation will require much research and data, a consistent and practical set of standards and terminology, and a progressive program of noise reduction objectives.

Speaking of legislation, we in Nassau County share the view of the majority of local governments that legislation be initiated immediately to assign the control of aircraft noise to the EPA. This legislation must be aggressively expedited to end the monopoly of the antienvironmentalists.

The construction of sound-proof buildings could develop through a review of existing conditions, and a reappraisal of building design and materials. This would apply to those buildings near airports or major highways where further reduction of noise at its source becomes impracticable. This approach would be facilitated through community planning and building code modifications. Noise criteria will be increasingly important and an element in current and future community planning. The planning of interzone buffer areas should permit expansion of facilities without major community disruption or the increase of ambient noise conditions. Land contouring can be applied to assure maximum acoustic shielding for new mass transportation and highway systems.

Noise control education is essential to promoting better understanding in the community of the nature of noise, its effects, and the means for its control. Our bureau has conducted a series of prototype noise talks, and believe that much can be gained by this method of community service. Education would lead to more selective purchasing by the consumer in the market place, better maintenance of equipment, and greater understanding of the health effects of excessive noise. Education in the community will facilitate a better communication between the man in the street and his representative in government.

Enforcement of noise ordinances or the investigation of noise complaints will require establishment of consistent and practical measuring methodology and terminology. The variety of noise definition terminology is very broad with terms such as dbA, PNdb, NEF, sones, phons, and others. This variety of noise indices is based on one criteria or another and reflects values placed on intensity, frequency, duration, time of the day and number of noise exposures within a time period. These noise indices must be correlated or modified to facilitate noise measurements with relatively simplified instrumentation. We are in favor of the establishment of a universal standard. The dbA scale or as modified should be acceptable to all enforcement situations.

In closing, I should like to state that, we as a local agency shall continue to serve the community in the resolution of noise problems. We shall endeavor to educate, motivate, and cooperate with all constructive forces for better noise control.

We shall proceed with the development of a practical and effective noise control code. Our study of noise pollution in Nassau County is soon to be completed. This study will include

a summary of noise problems and sources and a tabulation of priority approaches to their correction.

We are including a preliminary release of this section of our survey with this testimony in the hope that it might contribute to the productivity of this hearing. Copies of the complete study report will be provided to the EPA in several weeks. We hope it will provide some insight into the problem in Nassau and into the recommended action to reverse the trend of increasing community noise in America.

Dr. MEYER. The study that you mention will appear in the record, following the verbal statement, and if we do get the complete report within about 3 weeks, we will put it in the transcript also.

Mr. CUSUMANO. Thank you.

Mr. Cusumano's study follows:

NOISE SOURCES ENCOUNTERED IN NASSAU
COUNTY AND RECOMMENDED METHODS
FOR THEIR CONTROL

Noise, as unwanted sound, can originate from countless sources. For this reason, the control of noise can take many forms; and each situation can be resolved in a variety of ways. In this study, a number of noise sources common to Nassau County communities were listed; and a number of action courses were developed for prevention and/or correction. Technological developments in the state of the art could make additional contributions to increase the list of alternatives many fold. Priorities given are affected by subjective factors and are, therefore open to revision. The following tabulation of noise sources and their control will illustrate the noise source and/or preventive corrective action possibilities. Only the immediate possibilities are shown and an attempt to establish an order of priority is indicated by the numbers used in the table.

A. Earplugs, muffs, mini-shelters, etc. to protect personnel from external noise sources.

B. Enclosures for the acoustic containment of noise sources.

C. Retirement or substitution of high noise level equipment by uprating or eliminating process.

D. Manufacture or redesign equipment to comply with more stringent noise abatement criteria and levels. This approach to consist of any one or combination of the following:

(a) Noise design criteria incorporated during conceptual design stage prior to production of equipment.

(b) Noise design criteria introduced during production stage to uprate equipment in production.

(c) Noise design criteria introduced during service life of the equipment in the form of a retrofit design. The retrofit to involve a modification or rework onsite to correct an excessive noise design condition.

E. Study, research and/or development programs for new materials, methods of construction; and product design. These programs to be coordinated between industry and government to achieve optimum control.

F. Basic building, zoning, or other code criteria for adequate noise control. This criteria to not only define building structure requirements but site geometry, land contouring, and landscaping for noise control as well.

G. Legislation and criteria, at Federal, State, interstate, and local levels as appropriate.

H. Motivate public support through education. This support to be in the form of voluntary action toward compliance with local antinnoise laws, and greater responsibility for community needs.

TABULATION OF NOISE SOURCES ENCOUNTERED IN NASSAU COUNTY AND RECOMMENDED
METHODS FOR THEIR CONTROL

	Abatement method or corrective approach							
	Personal protection	Enclosures	Equipment replaced	Equipment redesign	Research and development	Building and zoning code	Legislation	Public education
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
A. Transportation:								
1. Aircraft		2		1	2	3	1	
2. Motor vehicles								
a. Automotive				1	2	3	1	
b. Trucks and buses		2		1	2	3	1	4
c. Recreation vehicles				1	2	3	1	4
3. Railroad		3		1	2	3	1	
4. Other Categories:								
a. Powerboats		3		1	2	3	1	4
b. Special vehicles		1		1	2	3	1	4
B. Residential—Exterior:								
1. Air conditioning, heating, and ventilating equipment		1	2	3	4	1	2	1
2. Lawnmowers, snow blowers, and other service equipment	1		2	2	3	1	1	
3. Recreational activity noise, social events		2				1	1	1
C. Residential—Interior:								
1. Air conditioning, heating, and ventilating		2	2	2		1	1	1
2. Appliances		2		2		1	1	1
3. Recreational devices, radios, phonographs, television, and other social activities						1		1
4. Small arms ranges, power tools	1	2		2		2		1
D. Industrial, commercial and municipal exterior:								
1. Manufacturing equipment, machinery, and power tools	1	3	3	1	2	1	1	
2. Materials handling equipment fork lift trucks, cranes, conveyers, etc.	1	3	3	1	2	1	1	
3. Processing equipment fluids systems, dryers, filters, etc.	1	3	3	1	2	1	1	
4. Power generation and transmission (electrical, hydraulic and pneumatic power systems)	1		3	1	2	1	1	
5. Building construction and maintenance (jackhammers, tree equipment sand-blasters)	1	2	2	1	2		1	
6. Waste collection and disposal	1		2	1	1		1	
7. Alarms and warning devices				2	1		1	
E. Industrial, commercial and municipal interior:								
1. Manufacturing equipment	1	2	3	3	4	4	2	
2. Materials handling equipment	1	2	3	3	4	4	2	
3. Processing equipment	1	2	3	3	4	4	2	
4. Air conditioning, heating, and ventilating		2	3	3	4	1		
5. Power operation and transmission	1	2	3	3	4	4	2	
6. Office equipment			2	2	3			
7. Maintenance and services	1		2	2	3			
8. Incinerator machinery	1	2	3	3	4	4	2	

Dr. MEYER. We look forward to receiving this information, because it does turn out that we have a great need to obtain more information about the actual extent of the noise exposures and what is being done about them.

We have heard during these last several days from several political subdivisions and representatives of several states, a representative of New York City. And now from a county representative.

So I will ask our eminent elected official, Mayor Wise, if he has any questions or comments.

Mr. WISE. I am particularly interested in this paragraph on page 5, about the noise control education, because I think this developed in the past 3 days, that this is going to be an essential part of any successful operation. I wonder if you would elaborate on that a bit, and I might suggest—he speaks here of a series of prototype noise talks—it might be helpful to have one included in the record.

Dr. MEYER. Yes, very good suggestion, Mr. Mayor. If you would furnish us with a draft of one of those?

Mr. CUSUMANO. Fine.

Dr. MEYER. We will include it in the appropriate place.

Mr. WISE. How has it worked?

Mr. CUSUMANO. Well, we have had a AV resources man in charge of noise, an engineer who has been slightly impaired by a noise problem he encountered in industry, so he is "gung ho" in this area, although his time is shared with other pursuits, basically with motor vehicle problems.

One of the talks he gave us is an orientation type lecture for 69 municipalities, and we could probably make this up and submit it to the panel and to the Environmental Protection Agency if that is desired.

Dr. MEYER. We'd like very much to have it.

Mr. CUSUMANO. Fine.

Dr. MEYER. We will distribute it to the panel for their review as well.

Mr. BERLAND. Picking up on the same point, you don't mention—I wonder if you thought there would be a role for citizens groups in this scheme?

Mr. CUSUMANO. Citizens groups and all residents really, whether they are active with groups or independently, are really our best ally to getting something done that has to be done.

Our first course of business in any of our work is to service complaints. We do hope that someday we will have no more complaints, that we will take action before the condition arises. But at the present time we have both areas, air and noise, that are arising in complaints. So that the people still want service.

Now if they do form a group, well, this is probably a little better as far as the citizen action. It is more voices than their own, although we have had some individuals that voiced some pretty strong objections to certain local problems and they have gotten things done.

So it's a stimulus to a local agency to have this kind of interest and have people to want us to take action. Sometimes it's arbitrary, but—

Mr. BERLAND. How about flowing the other way. Do you see the citizens group as a vehicle of education for the community?

Mr. CUSUMANO. Yes, we do. We do have mailing lists of citizens groups which we mail out any impending forums or seminars that are coming up to get their participation and also hearings where we go before our county board of supervisors to get our legislation approved, and sometimes the attendance is not too good. We are on our own most of the time, serving the people.

Mr. BERLAND. You raised the question of proliferation of terms and kinds of measurements of noise, and I would think that from the local point of view, this becomes increasingly more important, and I know that this is the subject of the San Francisco hearings, but I'd be interested if your study has gotten into this, what thoughts you may have in terms of kinds of measurement and the need for an instrument that is accurate and yet not too expensive that could be used at the local level.

Have you gotten to this area at all?

Mr. CUSUMANO. I would agree with the desires you express, something that is inexpensive and can be readily applied by the type of person to go out in the field without sending an acoustical engineering expert every time there is a problem.

We do have 25 or so local regulations that include noise regulations in the 69 communities, and in some cases they don't have the personnel, really, that are trained well enough; and given the training and the equipment they have, and they don't have equipment in some cases, to really enforce their own codes, and the codes are pitiful as far as what really can be done to enforce the code. They are just inadequate codes.

Dr. MEYER. Dr. Johnson?

Dr. JOHNSON. On page 3, you indicated that it would be desirable for EPA to support certain research. Can you give us any suggestions as to what types of research you think EPA should support?

Mr. CUSUMANO. Well, I think probably one area of research might be in coming up with regulations that can be used that are practical and reasonable of enforcement, on a local or state-wide level. I think in the area of impact noises, I think this is probably one area that we are in the dark as to. This is why I think dbA fails perhaps here.

Dr. JOHNSON. What is impact noise to you?

Mr. CUSUMANO. I'd say an impulse noise, very fleeting, in the matter, say, of a thousandth of a second or something like this. Very short, piercing noises, as far as damage to the recipient.

This is another area, the health effect, that needs further definition.

Dr. JOHNSON. Thank you.

Mr. MARTIN. I have no questions. I just want to compliment you—being from Nassau County myself—yours is one of the first community presentations, that I think is a very realistic one, aimed to cooperate with the Federal Government and let the Federal Government actually set uniform standards that can be utilized.

Dr. DIETRICH. I just had a question about the table that you presented along with your testimony, called a tabulation of noise sources and recommended methods for their control. And looking under the residential exterior category for the all-pervasive noise sources such as lawnmowers, and other small engined power equipment, I notice that these have a priority ranking of one. Does that—for the record—reflect any pessimism on your part as to the ability of the designers of such equipment to reduce the noise at the source?

Mr. CUSUMANO. Well, in explaining this table, as you notice in that particular category there are several other ones. This is not a detailed study, so that we can come up with every solution to every problem.

When we did our air pollution study, which had a little more definition, for example open burning, and we got that into law. In this particular case, it's a little more difficult, and we use this approach to try to sweep through the field of noise sources in the county, coming up with what we think are the priorities of approach.

Now in the case of lawnmowers, snow blowers, something could and should be done now by the person or persons using this loud equipment, and that would rate one, along with building and legislation and zoning codes, that we felt should go along concurrently to start reducing and requiring industry to meet more rigid standards in this area.

Dr. DIETRICH. Then when you have a one under legislation for the same source, you are in fact contemplating legislation that would mandate manufacturer limits?

Mr. CUSUMANO. That's right, and the legislation is a broad category of State, Federal, local—and interstate is included here as well. We might, for instance, look up a bid of other categories, power boats, and special vehicles, where we don't have a tremendous problem in the county of Nassau, so legislation is stepped down to three in that particular area, whereas equipment redesign is something we would pursue with industries on our own perhaps, as an initial measure, to start control on a local level at least.

Dr. DIETRICH. Thank you.

Dr. MEYER. Thank you for a very comprehensive presentation of a major political subdivision's problem and how it is attempting to deal with the situation. We look forward to working with you further.

Mr. CUSUMANO. Thank you very much.

Dr. MEYER. I should now like to ask Mr. William R. Hutton to come forward.

Mr. HUTTON. Good morning. I'd like to submit my complete testimony and perhaps, in the interest of time, deal with some of the highlights of it before you this morning.

Dr. MEYER. We appreciate that, and we will see to it that your entire statement follows your verbal testimony in the record as it goes to the Congress.

**STATEMENT OF WILLIAM R. HUTTON, EXECUTIVE
DIRECTOR, NATIONAL COUNCIL OF SENIOR
CITIZENS, WASHINGTON, D.C.**

Mr. HUTTON. Thank you, Mr. Chairman. I am William Hutton, executive director of the 3 million member National Council of Senior Citizens, which is the largest organization of older people's clubs throughout the United States.

There is, I submit on their behalf, widespread concern among the elderly about noise control, and I judge that from the many letters which the national council has received in the past few years, and on the discussions at our most recent convention.

The national council became involved in the campaign for noise abatement while pushing for enactment of the historic Federal occupational safety and health legislation of 1970. In emphasizing the injury suffered by many workers due to noise pollution, we discovered it was a rapidly spreading problem affecting men and women of all ages.

We learned that 15 percent of hearing loss among those age 65 or over comes from exposure to the increasing deluge of noise we are all subjected to a great deal of the time.

Now until recently, the Federal Government has shown really little interest in the environmental noise problem. Of the small funds that were available, over 90 percent went for research on aircraft noise.

However, as witnesses, including a number of senior citizens who lived around airports, have testified, the noise around airports is getting worse rather than better.

Now we are well aware that much can be done to control this environmental blight at the local level, and I was particularly interested in listening to the previous witness, and that is why we are telling our members around the country to find out what local antinoise regulations there are, who is in charge of their enforcement, are they being enforced, and all the rest of the basics that make up an effective local community action program.

I'd like to add at this point that local action programs do not seem to have much effect against the jet noise around airports. National council members do not seem to be able to persuade any governmental authority to assume responsibility for controlling this environmental insult.

If they complain to the Federal Aviation Administration, this august body claims that the control of airport noise is locally a concern of either the municipality the airport serves, or the organization that operates the airport.

Yet, when these groups are approached, they maintain that they are just responsible for ground operations, that controlling jet noise in the air is the FAA's job, and so it goes on.

Even if we disregard jet noise, local programs represent only a partial solution to the problem in our view. Our organization has learned that local efforts are no real substitute for a vigorous Federal program of research, training, grants, standards and enforcement.

The national Council of Senior Citizens welcomes the administration's antipollution measures as a step in the right direction, but in the area of noise control we believe it falls far short of the need.

Our organization shares the view of Senator Alan Cranston of California that the power to control aircraft noise should be taken away from the industry-oriented FAA, Civil Aeronautics Board, and the Department of Housing and Urban Development, and turned over to the new U.S. Environmental Protection Agency.

We think this is an urgently needed step. We also believe in anticipating future problems which will arise, for example, when the Concorde, the 1,200-mile-an-hour plane being built by the British and French, goes into regular operation.

We join with Senator Cranston in urging immediate negotiation with foreign countries to set noise limits on all international flights, including the coming flights by the Concorde. Senator Cranston is the author of an amendment to the administration's antipollution bill that would require Federal action to control noise pollution by aircraft. His amendment would also require labeling of appliances and other noise-producing products used in the home to show the noise level in decibels of these products. This provision would cover such items as dishwashers, vacuum cleaners, air conditioners, and garbage disposal units, all of this have an effect on older persons living at home.

Speaking before the 24th annual conference of the Airport Operators Council International in Miami, Fla., last month, Cranston urged the aviation industry to take notice of the citizen protest against aircraft noise.

Senator Cranston said:

Cities already are wasting billions of dollars that could be spent on legitimate needs because they are forced to buy up homes in aircraft flight paths and millions more are being wasted at overcrowded airports because citizens oppose building noisy airports.

That is why, he says, he has joined with Senators Philip Hart and Mark Hatfield in urging legislation to toughen controls over industrial, transportation, and household legislation, to toughen controls over industrial, transportation, and household appliance noises as well.

Dealing with aircraft noises, Cranston said earlier this year, the administration introduced legislation to centralize authority over general noise pollution in the Environmental Protection Agency. But it failed to do anything about aircraft noise.

Jurisdiction over aircraft noise pollution is now spread principally among the Federal Aviation Administration, Civil Aeronautics Board, and the Department of Housing and Urban Development.

This dispersed jurisdiction has led to ineffective aircraft noise control. The FAA claims the CAB should control noise by reducing the number of flights. The CAB in turn says the FAA should take steps to reduce aircraft noise. And so we keep passing the buck around.

Everybody shifts responsibility, and little, if anything, effective is done. We need a coordinated approach. A single agency should consider the costs of land use, flight reduction and noise suppression as measured against the benefits of quieter communities. The EPA, the Federal Agency invested with control of all other pollution problems, is clearly the appropriate agency to carry out this task.

The Environmental Protection Agency should be given authority to set national goals for aircraft noise suppression. First step would be to develop graded geographical noise maps around all major airports and then determine appropriate land uses compatible with the population and air traffic. Each airport would then work out with EPA a 10-year plan to achieve the established goals. The CAB and FAA would make regulations within established guidelines. If, for instance, a reduced number of flights was found necessary, the CAB would decide which flights would be cut back.

The National Council of Senior Citizens members are not experts, and we rely on experts to find the way. We speak for only 3 million of the more than 20 million people over 65, and perhaps for another 20 million who are 55 or above, and getting on this way.

But we believe this noise pollution is an increasing menace to the elderly, and we hope Congress will soon deal with this problem by approving noise control legislation proposed by Senator Cranston and cosponsored by Senators Hart and Hatfield. That is amendment No. 216 to the administration's pollution control bill.

Again, Mr. Chairman, I thank you for this opportunity of appearing before you today.

(The entire text of the statement follows:)

PREPARED STATEMENT OF WILLIAM R. HUTTON, EXECUTIVE DIRECTOR,
NATIONAL COUNCIL OF SENIOR CITIZENS

My name is William R. Hutton and I am executive director of the 3-million-member National Council of Senior Citizens, the largest organization of older people's clubs in the United States. I wish to express my appreciation for the opportunity to present the views of our elderly members before the Office on Noise Abatement and Control of the Environmental Protection Agency.

There is widespread concern among the elderly about noise control, judging from the many letters to the National Council of Senior Citizens from our membership and the public.

The 10-year-old National Council of Senior Citizens had an important part in enactment of medicare and has been active in seeking meaningful social security benefits, adequate medical services, housing within the means of the low income elderly, and federally funded employment for elderly men and women living on limited income.

However, our organization is more than a special interest group for the elderly. Members of the national council have supported legislation to improve the environment, consumer protection legislation, the war on poverty, the Peace Corps, occupational safety and health legislation and other measures to make America a better place.

The national council became involved in the campaign for noise abatement while pushing for enactment of the historic Federal occupational safety and health law of 1970. In emphasizing the injury suffered by many workers due to noise pollution, we discovered it was a rapidly spreading problem affecting men and women of all ages.

We learned that 15 percent of hearing loss among those age 65 or over comes from exposure to the increasing deluge of noise we are all subjected to a great deal of the time.

Experts on otology tell us these hearing losses do not yield to medical treatment. Likewise, these experts point out that environmental noise also interferes with successful use of hearing aids.

These experts also say the type of hearing loss usually associated with old age may be accelerated by the growing din that is part of the modern environment.

We are informed by hearing experts that this type of handicap creeps up gradually and is a particularly bothersome handicap since people, afflicted with it, are still able to hear conversation but have difficulty understanding what they hear.

Their hearing is good in the low and sometimes in the middle tones but they cannot accommodate to softer higher pitched tones. Unfortunately, it is these tones, resulting from enunciation of the consonants, that give meaning to spoken language.

I do not have to remind this distinguished body that noise is not only damaging physiologically but also psychologically. It can trigger fits of temper, headaches, sleeplessness, depression, and irritability.

Transportation, construction, and industry are recognized as important contributors to environmental noise, but air conditioners, lawnmowers, and other types of power equipment now in common use are problems, too.

Noise levels in apartments and private dwellings, particularly in kitchen areas, are beginning to approach those in factories. Current construction techniques also allow noise from the outside and from neighbors to intrude into many apartments and homes, letters from national council members reveal.

The experts say the overall level of environmental noise has been doubling every 10 years, keeping pace with industrial growth. In cities, noise levels are said to be rising one decibel each year and some observers fear that people who live in the noisiest sections will be deaf in the year 2000.

Many European cities have standards for sound transmission in apartment buildings and offices and for noise levels in the streets. Some places in this country have managed to enact noise control ordinances, but, from all we can learn, they are either impractical or ineffectual.

Until recently the Federal Government showed little interest in the environmental noise problem. Of the small funds that were available, over 90 percent went for research on aircraft noise.

However, as witnesses including a number of senior citizens who lived around airports have testified, the noise is getting worse rather than better.

One of the problems is the inability of complaining citizens to get public agencies to admit responsibility for controlling the flight operations of the jets which are the major source of the problem.

In 1970, Senator Edmund Muskie (Democrat, Maine), recognized the need for more Federal leadership in the noise field and added an amendment to his Clean Air Act which established an Office of Noise Abatement in the Environmental Protection Agency. The role of this office, has also, I am informed, been limited mainly to studying the problem and holding the public noise hearings.

At the present time, Congress is considering several new noise bills which would give your agency, EPA, the right to set standards for new transportation (including snowmobiles, motorcycles and other recreational equipment) and construction equipment as well as all machinery powered by internal combustion engines. Under these measures, EPA could also require noise labels on all products sold in interstate commerce. This would mean that a housewife buying a new vacuum cleaner or dishwasher could tell which ones produced less noise.

Senior citizens have a large stake in the battle for a less noisy environment since they are a special risk. But, as the New York citizens for a quieter community say, you have to make noise to stop noise pollution.

What do senior citizens have to say about noise? They complain about poorly constructed apartments and houses which do not block out unwanted sounds.

They say that household appliances are too loud, that motorcycles, hotrods, even lawnmowers, interrupt their leisure. They feel that truck and bus routes are set up for the convenience of vehicle operators rather than out of consideration for the comfort of the people who live along their pathways. Seniors wonder if construction work must always be so nerve shattering. They worry about jet airplanes that seem to be taking off and landing in their backyards.

In short, senior citizens, have the same complaints about noise pollution that other citizens do, but are victimized more by noise pollution because most seniors live in central cities where noise pollution is worst.

We are well aware of the fact that much can be done to control this environmental blight at the local level. That is why we are telling our members to find out what the local antinoise regulations are. Who is in charge of their enforcement? Are they being enforced? And all the rest of the basics that make up an effective local community action program.

I would like to add at this point that local action programs do not seem to have much effect against the jet noise around airports. National council members do not seem able to persuade any governmental authority to assume responsibility for controlling this environmental insult. If they complain to the Federal Aviation Administration, this august body claims that the control of airport noise is wholly a concern of either the municipality the airport serves or the organization that operates the airport. Yet, when these groups are approached, they maintain that they just are responsible for ground operations—controlling jet noise in the air is the FAA's job. And, so it goes.

Even if we disregard jet noise, local programs represent only a partial solution to the problem. Our organization has learned that local efforts are no substitute for a vigorous Federal program of research, training, grants, standards, and enforcement.

The National Council of Senior Citizens welcomes the administration anti-pollution measure as a step in the right direction but, in the area of noise control, it falls far short of the need.

Our organization shares the view of Senator Alan Cranston (Democrat, California) the power to control aircraft noise should be taken away from the industry-oriented Federal Aviation Administration, Civil Aeronautics Board, and Department of Housing and Urban Development and turned over to the new U.S. Environmental Protection Agency.

The National Council of Senior Citizens sees this as an urgently needed step. We also believe in anticipating future problems that will arise when the Concorde, the 1,200-mile-an-hour plane being built by the British and French Governments, goes into regular operation.

Members of the national council join with Senator Cranston in urging immediate negotiations with foreign countries to set noise limits on all international flights including the coming flights by the Concorde.

Cranston is author of an amendment to the Administration antipollution bill that would require Federal action to control noise pollution by aircraft. His amendment would also require labelling of appliances and other noise-producing products used in the home to show the noise level (in decibels) of these products. This provision would cover such items as dishwashers, vacuum cleaners, air condition and garbage disposal units, but would exclude TV and radio which have as one of their primary purposes the emission of sound.

Speaking before the 24th annual conference of the Airport Operators Council International in Miami, Fla., last month, Cranston urged the aviation industry to take notice of the citizen protest against aircraft noise.

Cranston said: "Cities already are wasting billions of dollars that could be sent on legitimate needs because they are forced to buy up homes in aircraft flight paths and millions more are being wasted at overcrowded airports because citizens oppose building noisy airports."

That is why, Cranston said, he has joined with Senator Philip Hart (Democrat, Michigan) and Mark Hatfield (Representative, Oregon) in urging legislation to toughen controls over industrial, transportation and household appliance noises.

Dealing with aircraft noise, Cranston told the airport operators: "Earlier this year the administration introduced legislation to centralize authority over general noise pollution in the Environmental Protection Agency. But it failed to do anything about aircraft noise."

Jurisdiction over aircraft noise pollution is now spread principally among the Federal Aviation Administration, the Civil Aeronautics Board, and the Department of Housing and Urban Development.

This dispersed jurisdiction has led to ineffective aircraft noise control. The FAA claims the CAB should control noise by reducing the number of flights. The CAB in turn, says the FAA should take steps to reduce aircraft noise.

Everybody shifts responsibility and little if anything effective is done. We need a coordinated approach. A single agency should consider the costs of land use, flight reduction and noise suppression as measured against the benefits of quieter communities. The EPA, the Federal Agency invested with control of all other pollution problems, is clearly the appropriate Agency to carry out this task.

The Environmental Protection Agency should be given authority to set national goals for aircraft noise suppression. First step would be to develop graded geographical noise maps around all major airports and then determine appropriate land uses compatible with the population and air traffic. Each airport would then work out with EPA a 10-year plan to achieve the established goals. The CAB and FAA would make regulations within established guidelines. If, for instance, a reduced number of flights was found necessary, the CAB would decide which flights would be cut back.

The National Council of Senior Citizens considers aircraft noise pollution an increasing menace to the elderly and we hope Congress will soon deal with this problem by approving noise control legislation proposed by Senator Cranston, and cosponsored by Senators Hart and Hatfield.

The Cranston-Hart-Hatfield legislation is amendment No. 216 to the administration pollution control bill.

Again, I thank you for this opportunity to appear before your agency.

Dr. MEYER. Mr. Hutton, I appreciate very much the fact that not only did you highlight the problems we are all deeply concerned about, but you made some very constructive suggestions at the end of your statement, suggestions that really don't require legislation for people to take action. We are going to see what we can do at getting at part of this.

I'd like to ask a member of another citizens group if he would like to direct any questions and comments first, and then go on to Mayor Wise and the rest of the panel.

Mr. BERLAND. I think you have really put your finger on a lot of our problems with aviation noise. I just wonder, though, from a practical point of view, why you feel that the EPA would do it, since the FAA hasn't done it, and the CAB hasn't done it.

Mr. HUTTON. I think largely because of the concentration of the whole of the environmental problem in one agency. FAA has got so many other things to do, and besides, it's got a long, long history of association and bending with the wind, if you like, to the powers of outside interests.

This is a new agency. And it hasn't had long to get tarnished, and I hope it won't.

Mr. BERLAND. You think, then, that it's more likely than other Federal agencies that it may represent the citizens?

Mr. HUTTON. We intend to try and keep it as clean as possible. We will watch it, and keep its feet to the fire.

Dr. MEYER. I can assure you that is the intent of the Administrator, Mr. Ruckelshaus, that we will be forthright in our approach to the problems, dealing with them from a technical

base and understanding all sides of the issue, both citizens, the public, and community, and the industries involved.

It's a difficult problem. I'm sure everybody understands that.

Mr. HUTTON. Yes, it is.

Dr. MEYER. But that's our aim, to try to be as balanced as we can in our approach to this.

Mr. WISE. I've been sitting here thinking, Mr. Berland, I think your organization would like to have his 3 million people in your organization, would you not?

Mr. BERLAND. Sure.

Mr. WISE. To my way of thinking, from the citizens standpoint, this would be an interest in which the elderly citizens could really be beneficial.

Mr. HUTTON. They surely can, sir. There is much that older people can do. Remember, your thinking powers don't stop at 65, even though industry tends to try to throw people on the shelf at 65.

Americans this age, it seems to me, are our greatest untapped natural resource. They have ability, they have experience, and they have got time on their hands, time which they can put to use in helping America to continue to develop.

They need some guidance and opportunity. This is an area where I think we are going to be moving closer into in the near future.

Mr. WISE. Your allegations about buckpassing are very, very true.

Mr. HUTTON. As a mayor, sir, you would know that.

[Laughter.]

Mr. WISE. That is where the buck stops, in my office.

Mr. HUTTON. Yes, it is.

Mr. WISE. And I think this is something that every elected official has to face up to. We have gotten into a habit, I believe, of acting in that manner. I catch myself saying, this is a county affair, not a city affair. And using it more really as a crutch than as a real genuine reason. And I have to examine my conscience about it, and I hope other elected officials are doing the same, and then proceed to act with that conscience.

So I think it's a valid complaint and it comes back to—I would agree—if the EPA is an untarnished agency that you foresee it as being, and I think it can be on its way to being just that—if they are, they can set the standards and local communities will stand by them, at a risk of considerable penalty if they don't—then I think that's good.

Mr. HUTTON. Thank you very much, Mr. Mayor.

Dr. DIETRICH. I would also like to add my congratulations on your presentation. I think it stated the feelings very succinctly. But I notice that you concentrated on aircraft noise almost to the exclusion of other sources, although I see in the written presentation that you do mention motor vehicle noise, construction noise, and so on.

And I just wonder if you would clarify for me whether you talked about aircraft noise because of some special situation in which the senior citizens that you represent are somehow more susceptible or more likely to be victims of aircraft noise?

Mr. HUTTON. Just that that seems to be the one which is most before their minds and they have committed themselves to local action on aircraft noise. I think, as it was mentioned earlier, they need some education on the other.

I know, for example, our own national headquarters, which is largely staffed by senior citizens, just outside they have heavy construction going on, and this construction was absolutely ear piercing for several months. Everybody wanted to do something about it, but they thought it was just temporary.

That's the way we get used to construction in the big city. We think it's going to go away sometime. But it just moves a block down the street and then comes back again.

So many of our citizens have not been educated to all of this as yet. I believe we are going to take an interest in the home area of noise pollution.

Dr. DIETRICH. Thank you.

Mr. MARTIN. I wasn't sure if you were referring to keeping EPA clean via the Clean Air Act.

Mr. HUTTON. That's just as important, sir.

Mr. MARTIN. I think it's a shame that many groups like yourselves couldn't have sat through all of these hearings, as some of us have sat through some of them. Your concern with the aircraft industry is naturally an honest one, and there is a lot to be done.

But I think it would be well worth while if the entire public was aware of many of the things that are being done and have been done within the industry, within the government, and that are moving in a direction—sure, you don't have relief today, but I think many of the things that are being done today and have been done over the last 5 or 6 years, will start to show relief in the aircraft field.

Maybe it will not be for 5 more years that you really feel the entire benefit, but if you had heard through these hearings the things that are being done, you would feel better.

Mr. HUTTON. Godspeed the day, sir.

Mr. BERLAND. Amen.

Mr. HUTTON. They also serve who only stand and wait, and so many of our senior citizens have been waiting, and they haven't much longer to wait, Mr. Chairman.

Dr. JOHNSON. I simply want to state that I find this presentation and the question and answer period to demonstrate a very profound depth of consideration, good judgment on the part of you and your group. And it's obviously well based, even though not technologically oriented.

Mr. HUTTON. No, it isn't.

Dr. JOHNSON. It does address the real problems which stand between us and the solutions, to put the solutions into action.

Mr. HUTTON. Thank you, Dr. Johnson, we appreciate that.

Dr. MEYER. We will be in touch with some ideas that occur to me as to how we can work for our mutual aims.

Mr. HUTTON. Thank you, sir.

Dr. MEYER. At this point, I would like to hear from Mr. Franklin Kreml of the Automobile Manufacturers Association.

STATEMENT OF FRANKLIN KREML, PRESIDENT OF THE
AUTOMOBILE MANUFACTURERS ASSOCIATION

Mr. KREML. Thank you, Mr. Chairman, and gentlemen. I am very pleased to be here. I am sorry to see Mr. Hutton leaving the room. I'd like to take this opportunity to offer him encouragement—as I approach my 65th birthday in a matter of a few days, I find I am still almost on probation on this new job, which took me on at the age of 64½. Mr Hutton should be encouraged by that.

My name is Franklin M. Kreml. I am president of the Automobile Manufacturers Association. The AMA is the national trade association of manufacturers of trucks and passenger motor vehicles in this country. We welcome the opportunity to appear today.

AMA is in accord with the intent of these hearings, and we offer our full cooperation in gathering information for your report to the President and Congress.

Since this is the concluding session in your series of public hearings, I would like to summarize, very briefly, some of the more significant positions expressed by AMA member companies at this and previous hearings across the country.

Following the summary of company testimony, I will introduce material which will suggest a strategy for reduction of annoyance to the public by motor vehicle traffic noise, and will address remarks to the subjects of technology and economics of noise control which, of course, are the prime topics of this hearing.

First the summary, Mr. Chairman. At previous hearings, conducted by the EPA Office of Noise Abatement and Control and in other public statements, various AMA member companies have provided extensive testimony and technical data. Of course, there are, as you know, antitrust constraints on AMA discussion of competitive aspects of vehicle noise control. Particularly as these relate to products and product cost.

Therefore, I am presenting a summary of points made by individual companies at previous hearings. Points made by any one company cannot, of course, be imputed to other companies. The points made are as follows:

(a) The technology exists for moderate reduction of vehicle noise levels using present design concepts.¹ (General Motors Corp. testimony, July 28, 1971, EPA Chicago noise hearing.)

(b) There would be an as-yet undetermined product cost increase associated with these reductions. (General Motors Corp. testimony, July 28, 1971, EPA Chicago noise hearing.)

(c) Noise standards sufficiently stringent to require substantial redesign of trucks would involve significant increases in vehicle cost and reductions in load carrying efficiency. (International Harvester Co. testimony, July 28, 1971, EPA Chicago noise hearing.)

(d) Uniform national standards are needed to eliminate unnecessary burdens which result from conflicting State standards. (International Harvester Co. testimony, July 28, 1971, EPA Chicago noise hearing.)

(e) Federal preemption of standardsmaking authority is necessary for orderly and efficient interstate commerce. (General Motors Corp. testimony, September 27-29, 1971, EPA San Francisco noise hearing.)

(f) Motor vehicle noise control standards must be compatible with the stringent constraints imposed on vehicle design and construction by Federal safety and emissions standards. (Ford Motor Co. testimony on S. 1016.)

(g) Research is needed in some aspects of vehicle noise reduction and noise testing technology.⁷ (General Motors Corp. and International Harvester Co. testimonies, September 27-29, San Francisco.)

So much for the summary. Now a brief discussion of the strategy for reduction of annoyance. Please note the semantics—a strategy for reduction of annoyance caused by motor vehicle noise.

Since the object of motor vehicle noise control is to minimize annoyance to the public, the AMA recently commissioned a major study ("Motor Vehicle Noise: Identification and Analysis of Situations Contributing to Annoyance," Bolt, Beranek & Newman, 1971.) to define what aspects of motor vehicle operation are most annoying to people. The study was intended to establish guidelines to needed areas of acoustical improvement of vehicles by manufacturers. The results of the study suggest an approach to diminishing the noise impact of motor vehicle traffic.

Some of the findings of the study are:

(a) To reduce annoyance from motor vehicles most rapidly, the noise from vehicles that cause peaks above background levels should be reduced, because it is the occasional noise excursion that produces most complaints.

(b) In the majority of cases where people expressed annoyance at a specific vehicle noise event, they felt that it was a situation the driver could control, such as tire squeal, hot rodding, and similar operations.

(c) Annoying noise sources are relatively close to the auditor; for example, 70 percent of the exposures described as annoying were within 100 feet of the noise source.

(d) Most people who express annoyance indicate that they are at home when the annoyance occurs and it is generally in the evening.

These are only a few of the findings of the study, but they have particular interest in terms of their application to noise annoyance reduction programs.

First, the assertion that peak noise levels are major contributors to annoyance is not to imply—I wish to emphasize—is not to imply that reduction of an excessively high overall background level would not be a worthwhile objective. It is intended to show that the most cost-effective means of reducing annoyance is to start with Federal standards that restrict the noise output of known sources that exceed the ambient level significantly. These include motorcycles, buses, sports cars, large trucks, poorly maintained vehicles, and any mechanical device whose noise output is noticeably above the general background level.

Second, the fact that people are annoyed by situations that are controllable by the operator suggests that local control of vehicle operation is necessary regardless of specifications for vehicle construction. This point has been repeatedly made, and we think it is worth emphasis.

Reckless driving, speeding, revving the engines, and modification of exhaust systems are amenable to local control only.

Preparation of model ordinances for the guidance of local communities, and development of simple, effective techniques which can be used by State and local officials to apprehend and convict violators are constructive actions that should be undertaken by the Office of Noise Abatement and Control, in our judgment.

Third, the fact that people are annoyed by those noise sources that are relatively near them suggests that land-use policy might be a highly effective tool in dealing with objectionable noise. Freeways and other major traffic routes should be planned with noise criteria taken into account.

As indicated above, relatively short changes in distances or spacing might have a considerable impact on reduction of annoyance. This is particularly important when dealing with high-speed traffic routes where tire noise is prominent, because of serious technical problems in the reduction of tire noise.

And finally, if people are most concerned with noise annoyance in their home neighborhoods, and particularly in the evening, traffic routes for particular types of noisy vehicles should be specified. This is nothing new on the American scene. Truck routes through cities, for example, are almost as old as traffic control and supervision.

Ordinances covering the operation of all vehicles in residential areas could be established, taking the hour of operation into particular account. The quality of the environment in the neighborhood of our homes should be a primary consideration in controlling noise.

The foregoing is, I submit, a broad outline of a program that if implemented would significantly improve the noise environment.

Now for a word about technology and the economics of noise reduction.

Modification of motor vehicles to improve their acoustical characteristics and to comply with regulations has been a competitive issue among individual manufacturers. AMA does not have knowledge on costs or plans of individual manufacturers—and is so forbidden by law from having such knowledge or using it—hence we cannot offer specific testimony in this area; and the Chairman understood this, I am sure.

However, there are some general considerations that should be called to your attention.

Since they are essentially different in their construction and use, we will discuss two classes of vehicles: trucks and passenger automobiles.

As regards trucks, reduction of truck noise is a difficult task because of the varied characteristics of the many sources of noise on each vehicle. They include exhaust, engine mechanical noise, air intake, fan, transmission gears, tires, and other miscellaneous mechanical appurtenances.

Some general observations can be made about these noise sources:

Truck noise reduction is not a simple question of putting on an improved muffler. Actions by truck manufacturers—development of test methods and a 125-dB recommendation of the 1950's is an example—and by State and local governments—the New York and California vehicle noise regulations of the 1960's—have driven down maximum truck noise levels to the point where muffling is available for most trucks that effectively eliminates exhaust noise as a consideration.

Tire noise is one of the most serious obstacles to noise reduction at higher operating speeds. Tire types considered to have the best durability and safety operating characteristics tend to have higher noise levels.

Several manufacturers have testified about the specific problems of dealing with other individual sources, including wind noise and engine mechanical noise, so I will confine my remarks to observations about the impact on the cost of transporting goods due to vehicle modification to achieve stringent noise levels.

First, there may be some increase in initial equipment cost, such as cost of larger cooling systems, for example. To place this in context, I would point out that factory sales of trucks and buses in the United States in 1970 amounted to \$4.8 billion; therefore, each percent of increase in cost due to noise regulations would be \$48 million that must be borne by the general public.

Second, to the extent that vehicle redesign for noise reduction involves need for more space and increased weight, and assuming—as we must, of course—overall weight and length restrictions on trucks, the added space can be acquired only at the expense of reduced cargo capacity.

For example, in a combination of tractor and trailer, an additional foot of cab or tractor length means a reduction of a foot of cargo space, to maintain compliance with length laws. A consequence is the need for more vehicles on the road to carry the same amount of cargo, hence a less efficient highway transportation system.

Third, there could be increased maintenance costs because of more complex construction and possible higher engine temperatures due to increased back pressure and enclosed structures. I am speaking now, of course, of the hood area and noise suppressant materials in that area. Also, there would be increased cost of tires if less durable types are required to meet noise specifications.

We are unable to provide specific cost figures for any of these factors. Before gross estimates could be made, considerable research on noise reduction techniques and their economic impact would have to be done.

As noise control standards are developed, we believe it is appropriate to consider cost-benefit criteria since it is primarily a question of annoyance that we are considering. The public good will not be maximized by insisting on maximum noise reduction at all costs, in our judgment.

As in any economic system where resources are limited, increased effort in one direction generally can be made only at the

expense of another. Difficult decisions must be made about the diminishing marginal benefits or satisfaction derived as more resources are devoted to noise reduction.

Now passengers cars. The modern passenger car is relatively quiet because most buyers have indicated this as a preference in their purchase choices. Quietness has a demonstrated appeal for most car buyers.

Quietness has not been the usual criteria in other types of vehicles such as heavy trucks, as just discussed, which are valued primarily for their load-carrying efficiency.

Next a word about uniform national standards. After all the information and evidence is evaluated, if it is judged that the public interest requires lower noise levels and special effort to control peak noise situations, then appropriate national regulations on manufactured products should be enacted and steps taken to insure adequate local control of noise. The regulations should be applied impartially so that all segments of society bear their share of the effort.

Uniform national product noise performance—I emphasize performance—standards would place the cost of noise reduction at its market value by requiring manufacturers to achieve the standard levels in the most efficient way. Whatever the cost, it will be reflected in the price of the product just as is any other design constraint.

We believe that Federal preemption of new product standards by the issuing authority is essential. It is essential to orderly mass production processes, and it is essential to interstate commerce. Further, in the case of trucks, Federal preemption of noise standards should extend to the operation of vehicles in use as well as to specification of levels for newly manufactured products.

Heavy trucks are more often operated near their maximum power output than passenger cars and light trucks. To allow lower local standard operational levels would negate the purpose of Federal preemption.

With the possible exception of tires, which can be treated as a separate entity interacting with the road surface, vehicle noise regulations should specify total vehicle noise output. For example, we know of no way to make a muffler by itself, in terms of its noise level, independent of the specific entire exhaust system in which it is used.

COMPATIBILITY OF STANDARDS

In evaluating the evidence and making your recommendations for standards, we urge you to consider their relationship to the stringent design constraints already placed on motor vehicles by safety and emissions standards.

As examples: tire safety performance characteristics such as traction and skid resistance may be more important than noise reduction—more important to the public. Muffler design changes by the manufacturer to meet lower noise-level performance standards must take into consideration the systems yet to be developed to comply with vehicle emissions standards.

A clear order of national priorities should be established so that more important goals are not sacrificed in pursuit of the lesser.

ENFORCEMENT OF REGULATIONS

We come now to an aspect of vehicle noise reduction programs that is crucial—most crucial, in my view—it is enforcement. The State of California has had a viable program for a sufficient period of time so that some conclusions can be drawn from their experience.

First, separate regulations for operators and manufacturers, which recognize their capabilities and responsibilities, are necessary. The manufacturer needs a procedure by which he can satisfy himself and the regulatory body that his products comply with the law at the time of sale.

States, on the other hand, or other local agencies, should have the authority to decide the necessary degree of regulation of their citizens as vehicle operators, in terms of prohibiting noisy, abusive operation of vehicles which otherwise conform to Federal noise performance standards.

They also need authority to enforce maintenance responsibilities of the operators. It is for similar reasons that speed laws and vehicle safety maintenance requirements are left to the discretion of States and local communities, in the context of the national highway safety program.

Another obvious observation is that noise standards mean nothing if they are not enforced. In spite of the fact that the California Highway Patrol have made a significant and commendable effort, and have in their judgment made reduction in vehicle noise, a recent California Highway Patrol study of vehicles in use shows that 10 percent of trucks, 12 percent of automobiles, and 75 percent of motorcycles on certain occasions exceed their respective operator noise limits. This is no doubt largely a result of inadequate maintenance of muffler systems, use of inadequate replacement mufflers, bad driving practices, and the fact that many older vehicles, predating the advent of California regulations, are still on the road.

I submit that a reduction in the legal limits on operators or manufacturers will result in no great improvement under these circumstances, and, further, that until such time as the great preponderance of vehicles can be constrained to conform to a given standard in use, the value of lowering the standard levels cannot be assessed.

For these reasons, we recommend that the development and evaluation of effective enforcement procedures be given high priority in your deliberations. We urge you to call upon the technical expertise available in the Society of Automotive Engineers to assist in this effort.

I'd like to say that the International Association of Chiefs of Police might have certain administrative input that would be useful also.

In summary, we have presented an overview of the positions taken by our member companies on some of the significant issues—I emphasize, some of the significant issues. We have recommended a strategy for reduction of noise annoyance, and have given you our views on the broad major considerations of technology, economics, standards, and enforcement.

I will conclude with five recommendations:

(a) That, after thorough study of need, uniform national standards be issued, with Federal preemption and consideration of possible conflict or trade-off's involving safety and emissions standards.

(b) That model legislation be developed for the guidance of States and local communities. We think this is imperative.

(c) That effective enforcement procedures be developed for State and local use.

(d) That a long-range policy of motor vehicle noise reduction be undertaken, taking technological and economic feasibility into account.

(e) That substantial research efforts be undertaken addressing the problems of tire noise and technology of noise reduction and comparative economic impact of noise regulations at various levels.

Mr. Chairman, and gentlemen, I thank you for your attention.

Dr. MEYER. Mr. Kreml, thank you for giving us a concise overview of the entire problem. As you indicated, much of this we have heard various parts of, but this is the first time the whole thing has been put together in such a concise manner.

Many elements of your recommendations are embodied in the legislation pending in the Congress.

Mr. KREML. Yes, sir.

Dr. MEYER. And I can assure you we intend, if the legislation is enacted, to proceed to try to do something about those things.

Also, the panel realizes that we are going to hear about the tire problem in a very few minutes. Dr. Dietrich will start off the questions, and then we will come down the panel.

Dr. DIETRICH. I have a question which relates to two statements, one of which is a quotation you included from an individual manufacturer who I think pointed out quite rightly at the Chicago hearings, that noise standards that would be sufficiently stringent to require substantial redesign, would of course carry with it a considerable cost penalty at this time, and I think in the short quotation you have, this leaves out—not deliberately—that this is true because of our present state of knowledge.

In the future it may be that, given adequate time, there would be no severe cost penalties if adequate time were given to develop this.

Well, I was concerned in comparing that with the statement that you made toward the end of the presentation where you said that you believe that a reduction in the legal limits on manufacturers would not result in great improvements under present circumstances, and by present circumstances, you just reviewed the experience of the California Highway Patrol and said that there still remains a sizable problem.

And I was wondering whether—how—you would explain—or would you care to comment about the need for at least expressing some numbers which represent goals or limits for the future, because if they are not expressed at this time, how will you know what to work toward?

Mr. KREML. Yes. Well, let me first say something that generally explains the position, which is perhaps unnecessary to say, but I

can't take that chance. Because I think this point is so important.

Let me simply draw a parallel from another field—safety. Highway safety. There is considerable pressure now to cause a reduction in the blood alcohol content allowable by volume from 15 parts in a thousand to 10. Well now, given the present state of enforcement, in this area, in the United States, if I may be permitted, without any lack of dignity on my part or any lack of respect for this distinguished panel, to say that the effect of that on the offense of driving while intoxicated and all the evils that grow out of that in this country won't amount to a damn.

Dr. DIETRICH. Because of the enforcement level?

Mr. KREML. Of course. Because we haven't begun to make the 15 parts in a thousand level genuinely effective in this country. And if I may now speak as a citizen—which rights I certainly haven't renounced in taking on the responsibility with the manufacturers—I object to being told in effect that the situation is going to be improved for me and my family as we operate on the highways, because we have just taken a dramatic national action in causing the States to reduce by a third the level of permissible blood alcohol by volume, when, as a matter of fact, this isn't going to do one damn thing to reduce driving while intoxicated on the highways.

Now it is precisely the same point that is made here in principle. And I repeat, this may have been completely obvious to each and all of you, and if it is, I apologize for taking your time, but I couldn't chance that you did not notice it.

Dr. DIETRICH. No, I certainly didn't, and I don't believe that any of the panel believed that the mere writing down of some numbers, some requirements for greatly reduced noise achieved the result.

Mr. KREML. Well, but we must, sir, go another step. That is, if, having written down those numbers, we now require the public to pay for certain equipment changes, aimed at producing those numbers by design, by the design of the vehicle, and the enforcement level is such that this is really meaningless in terms of what is actually happening on the highways, you have a one-step extension of the point that I just made a moment ago.

Now I also was very careful to point out that we are not resisting such changes. This is also clear here. But what I am talking about, if I may be permitted to use the term, is a common sense appraisal of how this best gets done most rapidly, most economically, in the public interest—but gets done.

Dr. DIETRICH. I think your point is very well taken about the fact that it has to be a comprehensive program that has some action and some enforcement to it.

Mr. MARTIN. I have no questions.

Dr. JOHNSON. I thought your summary recommendations were commendable. However, I was surprised to find those, after having gone up to that point apparently in an opposite direction.

Mr. KREML. I am not sure I followed that, sir.

Dr. JOHNSON. I will get to it.

Mr. KREML. All right, sir.

Dr. JOHNSON. But I think we should begin by some definition on your part of annoyance. I am not at all sure of what you mean

by annoyance. And it led to my lack of understanding as I found the results not being as comprehensive as I thought they should be.

Mr. KREML. Yes. Well, I don't know that I can satisfactorily answer that question, for two reasons—though I shall try.

First of all, I am in my fifth month on this job, and secondly, I am a lawyer by training and an administrator by experience.

And this study was started, and completed for that matter, before I came aboard. But my understanding of this, and if I may, I would like, Mr. Chairman, to turn to Mr. Sherman, the director of our engineering division, who would know precisely about this, if he or any one of you feel my answer isn't completely satisfactory.

The primary purpose of the study was to determine from the citizenry—and this was the focus that was taken—from the citizenry, what noises they consider, by their definition, to be annoying. Now if in fact this is annoying to you, sir, as Citizen Johnson, and it is annoying to me as Citizen Kreml, then we thought this ought to be embraced by the research.

Mr. SHERMAN. I think that is adequate. The intention was to determine, by a combination of interviews of groups of citizens in different localities, and then instrumentation, determinations of ambient and the peaks in their localities, precisely what led them to be either privately annoyed or make a complaint of annoyance.

And this was information that was sought in the light that if the vehicle manufacturer then had any ability to make changes that would be responsive, it would provide a priority for the vehicle manufacturer in directing his efforts in noise control on vehicles.

Dr. JOHNSON. Did this include interrogations in downtown areas, business areas, as well as residential?

Mr. KREML. Downtown areas, areas near major freeways and interchanges of freeways and State highways, urban and suburban areas. And in six cities.

Dr. JOHNSON. The reason I am exploring this, the impression I got was that you did not place much weight on annoyance, and I can see that you can't place much more weight on it than you did in the type of interviews you did. You let each person define for themselves what annoyance was.

But I think as far as the panel is concerned, and the total Nation is concerned, that we would not be willing to settle on that definition of annoyance, because if annoyance is simply a distraction from a train of thought, you might say it isn't too important unless it interferes with your job.

Now when it starts to interfere with your job or your livelihood, then it becomes important. So the impression I got was, yes, we made the study on annoyance, but it's really not too important to us as citizens, and I think in our total definition we will not stop there, as merely a slight distraction.

Mr. SHERMAN. We'd be happy to provide the entire report for the members of the panel.

Dr. MEYER. I'd like to have that, and if Dr. Johnson would yield, I would like to make an observation. We have a classic ex-

ample in this room right now of annoyance. Not in this dialog between the witness and the panel, but we have had rumbles of plumbing, and we have the door open and people are going by.

If you just look around at the reactions of the people sitting here, almost each individual is turning his head and looking in the direction of the source of the noise.

This was mentioned by Mayor Wise the other day, when the telephone was ringing in a hearing. It highlights one of the real difficulties that those of us who have to move into the everyday activities relating to this sphere of performance, in terms of setting of standards and enforcing them. What is a measure of annoyance?

And I know what Dr. Johnson is saying is that since there are no very good, precise measurements of instruments to take the measure of this, although we can measure the spread of human reaction, we do have to give this matter a great deal of attention, and your study will be of help in this.

Mr. KREML. I would like to add that I respectfully and gently disagree with what I think is your conclusion about our attitude of the importance of the annoyance. The fact that the study was commissioned by us and was directed primarily, very significantly, to annoyance, proceeded in the first place on the assumption that if the noise was dangerous to health, for example, obviously this has got to be controlled. This was given.

But beyond that, that is, the inception of the study, the initiation of the study said that beyond this, the question of annoyance in terms of the individual members of the society ought to be considered. And so this by itself indicated, I think, a very serious concern with the matter of annoyance.

Dr. JOHNSON. Yes, well, I appreciate that, and I'm glad that I did misjudge your attitude. I might say that I hope the way I misjudged the attitude of each of the other sections, except the last two, which likewise seem to be completely negative in nature, that is, the items you are covering are not really important, it's going to cost too much to make changes, et cetera.

But finally, your summary of recommendations that you came up with I think is pointed in the right direction.

I thank you very much.

Mr. KREML. I thank you, sir. I would like to only say that there was no intention, certainly—as I am as responsible for this paper as anyone—and it's certainly not our intention to be negative, but simply to present a balanced view.

And I dare to say a balanced view that represents significantly the public interest.

When I say, as I do in this paper, for example, that the reduction of all noise at any cost is, in effect, not in the public interest, this has been simply to give the panel a balanced view.

Dr. MEYER. Mr. Berland?

Mr. BERLAND. I have the same sort of feeling, of your negative stance here, and I am disappointed in that you try and represent the public view and tell the governmental agency what it ought to be doing, but I really don't find in here anything that the automobile manufacturers are going to be doing. I realize the constraints—we went through this yesterday on the engine manu-

facturers—and I appreciate the constraints in terms of cooperative research, particularly on proprietary products.

But I don't find here any expression of willingness or desire on the part of automobile manufacturers in funding or sponsoring such research to reduce noise.

Mr. KREML. Well, we just funded this research. This is the only piece of research currently done in this area. We funded it, and before this—

Mr. BERLAND. You mean the annoyance study?

Mr. KREML. Yes.

Mr. BERLAND. I will say again, I don't find any expression of desire on the part of automobile manufacturers in terms of reducing noise—not in terms of what the public thinks about noise, but in terms of substantive measures on the reduction of noise of motor vehicles.

Mr. KREML. Allow me, if I may, to respond to that, Mr. Chairman. We spent no time on this in this paper, and I am the one who edited it out, because I said, in the first place, it is so obvious—anyone who watched television advertising—I hope not too many people do—but those who do must know that the Federal Trade Commission at least is allowing our manufacturers to advertise that we have the quietest cars in the world.

So I said this is, on the one hand, so obvious. And on the other hand, so seemingly self-serving, that it doesn't belong in this testimony.

Apparently I misjudged the subject or misjudged you, or whatever.

But what the manufacturers have done is, I thought, known to everyone who sees advertising or rides in Americanbuilt automobiles. We build the quietest automobiles in the world.

Mr. BERLAND. You spent most of your testimony talking about trucks and some problems, but I don't see an expression toward solution.

Mr. KREML. Because we acknowledge that the truck is a problem.

Mr. BERLAND. We all agree with that. I don't see testimony on buses. Does your society not cover buses?

Mr. KREML. Yes. Motor vehicle manufacturers do, of course, among other things, make buses as well as trucks.

Mr. BERLAND. Is there some reason that wasn't covered?

Mr. KREML. Part of it, of course, is that we wanted to have a viable presentation in terms of length, and it seemed to me it was already overly long. The things that have been said about trucks and passenger cars have, each of them, some application to buses.

Dr. MEYER. I think the record will show—again, trying to keep a sense of balance—that in the Chicago hearing, a considerable amount of testimony was received from the individual companies regarding the numbers of personnel they had working on automotive noise, research associated with the vehicle itself. Obviously, they weren't about to give us complete information on the extent of expenditures, but there was some fair degree of discussion of their programs, not only with regard to passenger cars, but to trucks.

So I think the record should show, for those who need to know more about this, that the transcript of the Chicago hearing is relevant to this problem, and also, to a certain extent, some of this was covered in the Atlanta hearing.

Mr. BERLAND. Has your association addressed itself at all to any research in terms of automobile signals, specifically sirens and horns?

Mr. KREML. No, we have not. This is the only research we have done—the study herein referred to is the only research we have commissioned thus far.

Now we recognize this, of course, is an area—the area of noise—is one that is important to the public and important, therefore, to the industry, and one in which we shall have to do more work, and precisely what that work will be and when it will be undertaken, I am not prepared to say today, except to state generally that we will do further research in the area.

Mr. BERLAND. Do I understand that the association is going to fund some basic research in the whole area of noise in motor vehicles, or are you asking the Federal Government to do it, or do you think it ought to be both?

Mr. KREML. Well, it depends on what research we are talking about. I don't think we are talking about fundamental research or important research. I don't think this is called for. We are talking about essentially engineering research, in any case. And how that should be funded, of course, depends on what the particular subject is. We think generally that it's most desirable for the Government and industry to join, that is, this gives the greatest possible assurance of the validity of the research and the serving of the broadest possible range of interests.

And if money is going to be spent—anybody's money—hopefully it does embrace a broad spectrum of interest. It has the further advantage, I think, of helping to insure the validity of the conclusion or at least the acceptability of the conclusion by the Congress, by the legislative bodies, and by the public.

Mr. BERLAND. I think you put your finger on an important point there. One of the problems I found, with all due respect, and not just to your association but it applies in general, one of the problems I found with any research is, you have to go back to who sponsored it, and if the Automobile Manufacturers Association is going to assess the amount of annoyance that the public feels, that is something not completely representative.

Mr. KREML. Of course, I recognize this is true today. I would only like to observe that it is a most regrettable situation. I think the sole test is who conducted the research. Now if, as a nation, we can't accept such criteria, we have fallen on bad days, in my opinion.

Mr. BERLAND. Unfortunately, the principle always applies that "who pays the piper, calls the tune." It shouldn't apply to research. I'm not accusing EPA. This is in the abstract.

Mr. KREML. Many of my academic colleagues would take violent exception to that, sir.

Mr. BERLAND. I am afraid they would agree with you.

Mr. ELDRED. I didn't hear the testimony, but I have been following the line of questioning. The fact that the industry recog-

nizes that the research was necessary and the Government has not done it, and therefore, the industry went ahead and sponsored it, to find out answers to questions to guide future developments, is a very commendable sort of thing.

If anybody is wrong, it's the public at not having anticipated the problem.

But a more fundamental thing would be an industry commitment in the area. I think the support of the development of a standard on trucks, and the actual containing in that recommendation of 125-sone limitation—and as I understand it, many of the manufacturers agreed voluntarily to go along with that limit—is an extremely important action on the part of the entire automobile industry.

And that recommendation, with further modifications, has actually been picked up and used for regulations by States as a basic model.

But this went along—this was quite a long time before the general theme of environmental pollution was a generally public issue.

Dr. JOHNSON. I, too, wanted to add something, as the chairman did, to make sure we have a balanced record here. I certainly do appreciate the expense and effort required in noise reduction, having worked for 8 years on noise reduction problems on mufflers for trucks and all types of noise reduction for passenger cars—and after you have worked for 3 years, finally learning how to reduce, for example, certain noises in a differential, lo and behold, some other part of the organization made a decision to change the differential, and you start from scratch again.

So I recognize it is not an easy process, and it's expensive, and I think it's very important that we do have overall targets that we are shooting for, and it's best that these be from a national basis, as you indicate, so everyone is equal.

And I think certain improvements can be made, but I don't think these are always expenses over and above what you would already be committing yourself to anyway, because research is going on in these areas at all times.

Mr. MARTIN. I'd just like to ask a question related to Mr. Berland's question and your response.

In responding, you said the only noise study commissioned was the one on annoyance. You were referring only to the AMA as an association?

Mr. KREML. Of course. That was the question that was asked. What other studies the association had done or contemplated.

Mr. MARTIN. I think Mr. Berland was probably probing to see if there was research done in the industry, not just by the association.

Mr. KREML. Of course.

Dr. MEYER. One last comment or question, Dr. Dietrich?

Dr. DIETRICH. I was just trying to say a word about the work BBN did do for AMA, perhaps in answer to Dr. Johnson's question, that annoyance indeed covered everything outside of hearing damage and ranged certainly to cover all forms of task interference, work interference, sleep interference, everything ranging from that all the way down to minor interferences with con-

versation and those things which go below that to looking at things which just represented the hearing of something which someone wished they hadn't heard.

Now with respect to motor vehicle noise—and, indeed, with respect to another question from the panel—the study covered buses, trucks, motorcycles, passengers, multipurpose vehicles—all forms of motor vehicle transportation were covered, and these were broken out as vehicular classes, and also certain operational noise, and features such as horns and sirens were also broken out in the study and identified.

Thank you.

Dr. MEYER. I don't want to prolong this much longer, because of the fact that we have a number of other witnesses. But could I ask the distinguished witness a question about this also? I notice a comment was made in Mr. Kreml's testimony that most complaints seem to be due to noise at home in the evening.

Did the study by the association take into account that because there is a large segment of our population which is highly mobile, utilizing air transportation as well as other vehicles, including those produced by member companies of the Automobile Manufacturers Association, that a lot of people reside for the evening in motels and hotels? Did the study cover any of that segment of the population?

Dr. DIETRICH. I am not familiar with the social survey, whether it in fact covered hotel-motel situations. My guess is it probably did, because I know that the survey covered situations which are definitely not at home situations and specifically I am speaking to people who are annoyed by motor vehicle noise while they themselves are occupants in another motor vehicle.

So I believe, although the questions were asked of the respondents while they were at home—that is how they were located, and the selection of respondents was made by home address, I believe—the questions were asked broadly enough to cover all situations in which they have been annoyed with motor vehicle noise, so that the fact that it was the last time they were in a hotel, they would have responded that way, and it would have been picked up.

Mr. ELDRED. One of the key questions in the study was, When have you been most annoyed by a motor vehicle of any type? So it would pick that up. All situations.

Dr. MEYER. Well, I would like to reiterate one thing at this point. That is, first, my appreciation for your taking the opportunity, Mr. Kreml, to present these views; and second, to attempt to again present the point that there are many, many aspects of this problem, and certainly our agency intends to assemble all of the facts on all sides so that we can reflect a proper approach in taking into account this very complex question which you raise—economics. The other point is that I gather from your response to Mr. Berland's question that we need greater industry-Federal Government participation in a joint effort. And while there are problems legally, this is an area we do intend to pursue with considerable effort in order to get industry, Government, and the public interest groups together on the subject.

Thank you again very, very much, sir.

Mr. KREML. Thank you, sir. I appreciate the opportunity, and I must say, Dr. Meyer, we are gratified by your posture in this matter.

Dr. MEYER. Thank you, sir.

At this point, before proceeding with the other side of the transportation system which was alluded to as being a major problem—the tire—I am going to declare a 5-minute EPA ecology break. We will convene at as close to 11 o'clock as we can, to hear from Mr. Kigin of the Rubber Manufacturers Association and Mr. Hodges of the Farm Industrial Equipment Institute.

(Short recess.)

Dr. MEYER. I will call now on Mr. Joseph Kigin of the Rubber Manufacturers Association. If he will join us and tell us something about tires.

**STATEMENT OF MR. JOSEPH KIGIN, RUBBER
MANUFACTURERS ASSOCIATION, ON BEHALF OF
THE U.S. TIRE MANUFACTURERS**

Mr. KIGIN. Thank you, Mr. Chairman, and gentlemen of the panel. We bid you all a very good morning.

My name is Joseph Kigin, director of government relations for the Rubber Manufacturers Association, and initially I want to thank the panel for the opportunity of presenting the statement, as will in time be presented in behalf of the American Tire Manufacturing industry.

As you recall, Mr. Chairman, this is the third occasion that we have had to participate in your proceedings, the first two being Chicago and San Francisco. On each occasion, as we do on this day, I think we seek mainly to present the technical information to alert the panel to what we feel is prevailing public lack of information or misinformation about the economics and technology of tire engineering as it relates to noise generation.

On the two previous occasions, recognizing the technical discipline of this area, we have had a gentleman appear with me who now, I think, is becoming somewhat of a permanent part of your EPA statuary, Mr. S. A. Lippmann of Uniroyal Tire Co.

Beyond the presence of myself and Mr. Lippmann, we are not seeking to compete in terms of numerical strength, but we have a number of gentlemen here also whom I should like to introduce.

Dr. MEYER. And if we have any questions, you may direct them to them.

Mr. KIGIN. First of all, Mr. W. W. Curtiss, of Goodyear Tire & Rubber Co.; Mr. T. R. Wik, of B. F. Goodrich Tire Co.; and Mr. Lippmann; and Dr. George Thurman of Firestone Tire & Rubber Co.

Their being here indicates our willingness to have an open dialog with the panel and with the Environmental Protection Agency. I think each of these gentlemen is uniquely qualified to respond to questions you may have.

Now for the technical presentation that we have, I wish to turn the meeting over to Mr. Lippmann.

Dr. MEYER. Fine. Thank you very much. We are glad to see Mr. Lippmann again. And we do appreciate very much the extensive effort that you put into giving us this information.

Mr. LIPPMANN. Mr. Chairman, and panel. The first part of our presentation is a discussion of the scope of what we are presenting to you.

At two previous hearings at the Office of Noise Abatement and Control, the Rubber Manufacturers Association has presented evaluations of the state of knowledge pertaining to the technology of truck tires as generators of sound. Those presentations emphasized the broad relationships between the properties of tires and some of the objectives of the Environmental Protection Agency.

The presentations also contain judgments based on the stated relationships. The intention has been to supply an orientation so as to facilitate the Agency's initial exposure in an area that is not generally understood.

The RMA recognizes that the Office of Noise Abatement and Control will wish to examine data typical of that which underlay the assertions and judgments offered by the RMA. Furthermore, the ONAC has a further objective of expanding the base of knowledge in those technologies that will enable a reduction in acoustical intrusions of sounds from truck tires. Here, too, quantitative data are required to establish and justify a reasonable course of action.

For the reasons just stated, the RMA is submitting at this time the results of a variety of quantitative studies at the hearing of the ONAC. The information comes from a number of member companies of the RMA.

The data are attached to the written submission in two separate forms. One of the forms is a document on truck tire noise recently prepared by the RMA. It is the one with a picture of two trucks on the cover.

Dr. MEYER. It will appear in the record, along with the other document.

Mr. LIPPMANN. This document summarizes the salient points of interest and contains typical experimental data.

(The document follows on page 365:)

Mr. LIPPMANN. The other form is a packet of tables and graphs relating to these points, and also to others of potential significance to the ONAC.

(The document follows on page 401:)

Mr. LIPPMANN. The data are as collected, with possible experimental errors unrationalized, as are the effects due to differences in operating conditions and testing facilities. We anticipate that the recipients of the information would rather apply their own judgments to consistency of the underlying relationships.

Except where otherwise indicated, the data are taken according to the standard procedure outlined in the RMA's presentation in San Francisco on September 29, 1971.

In addition to placing quantitative information before the agency, the RMA is undertaking one further objective at this time. That is to review before the hearing the strengths and pitfalls of the dbA rating for measuring the significance of radiated truck tire sounds.

Following that introduction, we have a review of the data. The first point that has been of significance in our previous discussions has been time versus the level and meter rate. (Slide.)

Slide 1 shows the variations in instantaneous sound level as a coasting truck bearing test tires approaches and then recedes from the test location. Actually, there are two curves shown. One continues as a dotted line and the other as a solid line.

Two reference marks on the curve show the span of time integration for slow meter response and fast response.

Slow meter response is 1 second relaxation response, and fast response, two-tenths relaxation time.

Fast response captures the character of the peak more closely than slow response, and gives less weight to the sustained components of the sound than to the highly transient components.

Spectral characteristics. (Slide.)

Slide 2 is a typical power density spectrum for a coast test employing lug tires. For other tires, more than two peaks may occur and the number of significant peaks depends on the speed as well as on the tire. This is illustrated in slide 3 (slide) which is a 10th octave analysis of sound pressure. Here we have a variety of the speeds from 20 to 60 miles an hour and it is perhaps difficult to follow under these circumstances, but there are a number of peaks which do exist, and these do change with the speed. (Slide.)

Slide 4 shows one aspect of the differences between tonal tire sounds and nontonal. The tonal sounds persist after the sound level has passed its peak and this persistence, not the frequency content at peak, appears in general to represent the important aspect of these sounds.

There are four graphs on the slide, the upper two are spectra of a tonal tire and a nontonal tire at the peak level. These two spectra show only slight distinctions. The lower two graphs are spectra of the same tires at about 2 seconds after the peak. The presence of tones is now in evidence in the upper of the two (not in the lower) and the distinction between tires is clear.

Tire sounds compared with other truck sounds. This has been a matter of some significance, as far as regulatory processes in highway control. (Slide.)

Slide 5 illustrates the overlapping of sounds normally produced by circumferentially ribbed tires and by other components of a two-axled test vehicle. There are two one-third octave spectra on the slide. One is for a test which tends to minimize the vehicle sound by coasting the test vehicle past the microphone with the engine off.

The other is for a similar test but with the engine running, and with special quiet tires. In terms of radiated power at the microphone, the truck sounds are 15 times (15 decibels higher) for the combination than the tire sounds at 250 Hertz. As the frequency increases, the relative contributions change progressively.

The two sources are about equal at 630 Hertz (3 decibels higher for the combination), and at 1,000 Hertz the truck contributes only 20 percent of the sound (0.8 decibel higher for the combination). (Slide.)

Slide 6, which you are now seeing, is similar data but in this instance for a tire with a typical lug design. The slide also shows a spectral curve for the vehicle coasting on the lug tires.

Here the relative contributions of the truck and tires are not progressive with increasing frequency because of the spectral peaks in the tire sounds. Up to 250 Hertz, the truck contributes 5 times as much sound power as the tires (7 decibels difference). At 315 Hertz, the levels equalize. From 315 Hertz upward, the power levels of the tire sounds are about twice that of the vehicle in the spectral valleys (3 decibels difference), and are about 12 times that of the vehicle at the peaks (7 decibels difference).

I am sure you appreciate that the relationships shown on this slide are peculiar to the tires used on this test and to the truck used on this test, and will differ.

Mr. BERLAND. I don't understand what the vehicle base noise is. Is that without the engine?

Mr. LIPPMANN. The vehicle base noise is the noise that is made by the engine. The power-by is a combination. The vehicle base noise is the noise made by the vehicle riding on quiet tires, on tires that essentially are not commercial tires, that make very little noise.

Mr. CURTIS. It's from the previous slide.

Mr. MARTIN. When you say they are not commercial tires, is it understood why they are not used as commercial tires?

Mr. LIPPMANN. Because they don't have a balance of properties required for commercial uses. They are used in the test particularly because of the noise level. They might not have durability, tread wear, and so forth.

Mr. ELDRED. At what speed?

Mr. LIPPMANN. This is 50-mile-an-hour data. (Slide.)

This slide illustrates the progress in the spectrum to the various more complicated designs we have to have for practical purposes. The lowest curve is the smooth tread tire.

The next one is a tire that is smooth with the exception of the fact that there are circumferential grooves cut in the tire.

Following that is the commercial rib tire which also has provision for the removal of water and for providing gripping edges. And finally, in the upper curve, we have a lug tire which is designed for drive axles. (Slide.)

In this slide we demonstrate quantitatively the progression of changes in level, a weighted level that accompanies variations in distances between the microphone and the vehicle. As you might expect, as the distance increases, the level goes down.

I think we have described in previous testimony what the power laws are that relate to this. (Slide.)

We have alluded in the past to the importance of road surface in determining the levels of sound, and here we present some data to demonstrate this fact. This slide illustrates the dependency of the sound level and the spectral characteristics of tire sounds on

the nature of the road surface. Similar types of spectra occur on all typical road surfaces, but the spectral weighting differs. (Slide.)

You will find no reference to this slide in your text. The paragraph relating to this was inadvertently left out.

This is the effect of the speed on the level which we also have referred to in the past, at this point providing you with quantitative information.

The heading of section G, which we are at at the moment, is incorrect. It really referred to the omitted section. And this should be corrected to read, "The sound level and load and speed of travel." (Slide.)

This slide demonstrates the effect of tire load at constant inflation pressure. The table contains data both for a rib and a lug tire, and for concrete and asphalt surfaces. For the rib tire variations in load produce only small changes in the level. For the lug tire the change in level is again small but only for loads over 80 percent of rated load, but are significantly reduced at lower loads.

Data obtained for other tires than employed for slide 11 (on an asphalt surface and obtained by another testing group) differed in the indicated dependency of sound level on load at constant inflation. The level is found to increase with load. The apparent discrepancy has not been resolved. (Slide.)

Slide 12, which is the next one, for these other tests, shows that the character of the spectrum does not change appreciably with load.

The effect of variations in inflation pressure at rated load is summarized in slide 13. Only small differences in level are found to occur over a plus or minus 25 percent change in pressure.

Data are also presented in the packet which show that for simultaneous variations in load and pressure so as to maintain constant axle height, the sound level is insensitive to the load for variations down to 75 percent of the maximum rated load.

These matters we are talking of at the moment have their bearing on standardized testing procedures, as we have described in earlier testimony.

The next section deals with detected levels and wheel positions. (Slide.)

Published data indicate that rear tires on the axles of a—you will find your text needs to be corrected; it says 18 and should say five—five-axle truck assembly are more efficient radiators of sound than the other tires. Slide 14 contains data of a test program designed to explore this indication.

Smooth relatively noiseless tires are substituted for loud lug tires in various tests to establish the contribution from each of the axle locations (excluding the steering axle). The data indicate equal contributions to the peak noise level from tires at each of the axles. The tests are conducted both for asphalt and concrete surfaces.

Before we go into that, I think you can observe there is a 2- or 3-decibel difference resulting from doubling the number of tires that are contributing to the noise level, and this is exactly what one would expect if all were equal contributors.

The addition of sounds from the various axles depends among other factors on the separation in time of the tire sources as they pass the microphone. Slide 15 shows what the totalized contributions of identical drive and rear axle tires should be in the test. The sound level due to the drive axle tires is below its peak and contributes only moderately to the level at the time the sounds of the rear tires peak.

This is a factor one must consider in determining how total noises are evolved on vehicles.

The next section deals with construction changes in tires. (Slide.)

Data are also presented showing the 8.25-20 tire—and here we are not going to indicate anything on tires, because it would be a waste of time to do so—the 8.25-20 tire and the 10.00-20 tire in rib and lug designs (and each at their rated loads and inflation) produce about equal levels of sound. Carrying the same load on more smaller tires, therefore, would result in increased sound levels.

You would need a larger number of smaller tires to do it.

One set of experimental results illustrates the effect of tube-type and tubeless constructions. The tires are in both ribbed and lug designs and run on asphalt and concrete. There is no detectable effect due to the interchange of tube-type and tubeless constructions.

There are no definitive data as yet on the influence of radial and bias ply constructions on sound levels. Tires of these constructions and identical tread designs do not exist. However, the packet contains data for some available types of tires in these designs.

Tread wear and sound level. (Slide.)

Worn tires are significantly louder than new tires. The difference depends on the design and details of wear. Both on asphalt and on concrete, increases of sound level from 3 decibels to 6 decibels are in evidence. Sample data are submitted showing the effect of wear. The increase in sound level is not necessarily progressive with continued wear. The maximum levels often occur at 25-50 percent of wear.

I believe the slide is self-explanatory. I believe that is all we need in the way of slides.

One of the trade-off problems raised has been the elimination of lug types because of their elevated sound levels. This appears to require lowered frictional performance.

The available frictional forces at the drive axles is often a significant factor in the control of trucks under hazardous conditions, that is, low coefficient surfaces.

In general, cross lug tires exhibit over 15 percent more braking force and driving traction under these conditions. This difference often disappears on high coefficient surfaces, but at high coefficients, the advantage to be gained through the coefficient is much less important.

Now I would like to present to you our general consideration for means or procedures for evaluating truck tire noise for purposes of manufacturers certification and technical communications.

The first item under that would be general considerations.

It is common to rate the level of complex sounds after weighting the bands of the spectrum by the A-contour. This procedure roughly acknowledges the tonal sensitivity of the average person.

However, it is recognized among acoustical experts that the A-scale pertains to the auditory sensitivity of sustained pure tones (not mixed transient sounds), and also does not account for physico-acoustical factors other than sensitivity.

Nevertheless, the totalized decibel on the A-weighted scale does often provide a good measure of loudness and annoyance for sounds under many circumstances.

In view of this background, it is desirable to establish whether the peak level measured on a sound level meter weighted by the A-scale is an adequate indicator for rating truck tire noise. There are a number of factors that need to be considered in arriving at a conclusion.

For instance:

(1) The ultimate objective to be served by a measuring scheme and the measurement; that is, evaluating community disturbance and/or the peak radiated levels.

(2) The consistency of the rating with other measurements with which it is to be used; that is, to predict along with other vehicle sounds, the total sound level radiated by vehicles.

(3) Whether the measurement is overly restrictive of factors not involved in the usage of the measurement, due to an artifact of its makeup; that is, does it also measure and weigh sounds not contributing to the usage of the measurement.

(4) Whether the measurement is properly sensitive to those factors requiring quantitative identification.

(5) The practicality of the measuring scheme in the operations of industry and governmental agencies.

The next section is objectives—It has been our general experience that there are two separate aspects to the ultimate objectives to be served by the rating for truck-tire noise. One is to measure, communicate, and to assist in the control of the tire's contribution to the total sounds radiating from vehicles (however measured). Another is to measure, communicate, and control the intrusion of tire sounds into roadside communities.

The second objective differs from the first in that the level of tonal characteristics rather than the total level often is the more pertinent factor.

Consistency of rating procedures for truck tires and for the mechanical noises of trucks:

The peak sounds from trucks are currently rated on the A-scale using a fast meter response—that is, two-tenths second response time. As shown in the preceding material, peak tire sounds (A-weighted) correlate best against jury data at a slow meter response—which is a 1-second time. This has been interpreted to signify that the tonal content is somewhat better accounted for by the slow response because of the longer duration of tones than the remainder of the spectrum detected at the peak.

Consequently, we do not now have a single consistent measure that encompasses both the need for a tire rating that is directly

additive to the rating for mechanical sounds, and that simultaneously detects the intrusion of tire sounds.

Perhaps a dual rating scheme, or a compromise scheme might be found to serve both purposes.

It should be pointed out that the jury data that substantiated the utility of slow response was obtained with a small number of similar commercial designs and because of the limited range of spectral types does not adequately test the human reaction to tire noises.

Overrestrictions due to artifacts and appropriateness—If the A-weighted level at fast response were to be used for tires, a situation might well develop that penalizes desirable sound spectra of tires to the advantage of undesirable spectra. Tonal concentrations at moderate levels from careless manufacturers would be rated equal to a more distributed spectrum (arrived at through the application of expertise and diligence).

Controlling agencies would probably be tempted to lower the acceptance levels to restrict the spectrum of the poorly designed tire. This in turn would disqualify acceptable tires, and might well interfere with the engineering compromises for arriving at a desirable spectrum.

The same considerations apply to A-weighting at slow response, but perhaps are less severe than at fast response.

Practicality of various measures of sound Level—Since, as indicated in previous testimony, we are concerned here with a manufacturer's certification of tire sounds, the question of data handling and sound analysis do not bear on the practicality of arriving at a measurement. Once the sound tapes are processed for spectral content, a computer can carry out simple and complex manipulations of the data leading to the composite evaluation.

Proposals for measures of truck tire noise:

(1) Despite the error indicated in summing the various measures of tire sound with those of the vehicle sound (to attain the total level) on theoretical grounds there appears to be a reasonable utility to the dbA slow meter rate measurement. This measurement is integrated over a 1-second timespan and therefore should emphasize overlapping in time (required for additivity) of vehicle and tire sounds to a greater extent than the fast rate measurement.

The RMA feels that for the present the slow rate, A-weighted measurement might well serve the purpose for evaluating contributions to the peak levels of truck-tire combinations.

(2) The tonal characteristics, that in the long run might be the matter of major concern, are currently being investigated in considerable depth by the industry. Several ideas have been proposed but are yet not resolved.

A-weighting of the spectra appeared desirable. The sound evaluated probably should correspond to that which occurs about 6 seconds after the peak level. The A-weighted spectrum should probably be further weighed for spectral concentrations which deviate from the average energy level. The spectral detail needed (octave, one-third octave, one-tenth octave), is not clear at this point and also has to be resolved.

We offer some possible programs for the ONAC—The disparity between the present state of knowledge and ultimate objectives offers opportunities for the ONAC to supplement the actions of industry, the professional societies and other governmental agencies in the work on truck tire sounds.

While fully appreciating the ability of the ONAC to formulate such programs from available data, the RMA nevertheless hopes that its suggestions might be of value to the agency. The following are some suggested possibilities: (1) Define the standard road surface. (2) Define the standard worn tire. (3) Evaluate the importance of tonality of tire sounds to the objectives of the ONAC. (4) Determine the most suitable measure and the procedure for adding tire sound to truck sound for totalizing.

Mr. LIPPMANN. As indicated to the ONAC at the hearing in Chicago, the tire industry has been successful in its continuing efforts to hold the sound level to limits consistent with the present state of technology and performance requirements. Further improvements depend on the success of our ongoing efforts to advance the technology and can be enhanced by the assistance of the Environmental Protection Agency and other similar bodies. Thank you.

Dr. MEYER. Thank you very much, sir. The recommendations that you made at the end certainly are appropriate to the whole problem that was discussed with the previous witness concerning the question of enforcement as well as other aspects, because it's certainly going to be a difficult problem to come up with meaningful enforcement schemes unless some of these considerations are taken into account.

I will ask the panel, starting with Dr. Johnson, if they have any questions and comments.

Dr. JOHNSON. First I'd like to say I am pleased to see the progress which has been made in the last 15 years, since the time I left this problem. And also—well, the progress in two different ways—both technologically and cooperation among manufacturers. Because at that time, everything was secret.

I wonder if you might be able to expand the information that you have presented here by giving your views on the degradation caused by the very varied recapping organizations and their products?

Mr. LIPPMANN. The indications so far are that the structure of the carcass of the tire does not play a significant part in the generation of noise. In other words, that leaves the tread design pretty much to determine the noise level. The tread design and materials of the tread.

And of course, that is totally within the control of the recapper.

Dr. JOHNSON. Yes, well, really my question is, Do you have observations which would indicate that many of the recapping designs do not take noise into consideration in their designs?

Mr. LIPPMANN. I think there is an attempt to do so. I think there are designs on the market at the present time that are archaic. There is equipment out that was manufactured a long time ago, and this equipment is still producing tires, and that may be what you are referring to.

Dr. JOHNSON. I wish to insert the observation that I think EPA, of course, must give consideration to that as well as to the new product manufacturers.

Dr. MEYER. Yes, Mr. Martin?

Mr. MARTIN. No questions.

Dr. DIETRICH. No questions.

Dr. MEYER. Mr. Berland?

Mr. BERLAND. I seem to find some disparity between some of the things you said and some of the representatives of other industries. They said in the tire, noise is predominant, and not their noise. Do you have that sense of feeling?

Mr. LIPPMANN. I have felt that way. I have heard it. What we have tried to do here is take it out of the realm of opinion and we have given you spectra which are representative spectra as we see them.

Mr. BERLAND. Another disparity that I find is that your industry apparently has done some research on the noise generated by its product. And hopefully, I assume toward the end of doing something about the noise. I don't find this is true of other industries. I am not criticizing you, I am lauding you. It is a good effort on your part.

But I don't understand why your industry could do it, and others can't.

Mr. LIPPMANN. I can't speak for other industries. I can speak for ours, and where I misspeak, my colleagues will correct me.

The noise has been a salable item—the reduction of noise. One had to weigh noise in with all the other performance characteristics that a tire is called upon to have.

If noise could be reduced and everything else could be maintained, a tire would be a more salable product. So we have every reason to want to make a tire more quiet, under prevailing circumstances, circumstances that prevailed long before the environmental activities began.

So we have a background here. We see no threat in the Government's action here. We are very pleased to cooperate and participate in any way possible.

Mr. BERLAND. That's very commendable. Maybe you haven't cor to this point in your research. Have any of your members done any work in terms of tread design in terms of regularity of design—and I ask that question from my own reporting activities at the University of South Hampton, where they have done considerable work with the European manufacturers toward this end, and I wonder if you have had communication with them on this research?

Mr. LIPPMANN. What you are referring to is the regular spacing of tread elements?

Mr. BERLAND. Yes.

Mr. LIPPMANN. Yes. This is the first thing you look at, and there are some things that can be done that way. But there are limitations. As a matter of fact, we did report on this to the ONAC in the previous hearings at Chicago.

The limitations are this: You must have a certain number of gripping edges supporting tread elements in the contact patch between the tire and the road at a particular time. And it isn't

possible, for that reason, to have a very great variation in spacing. We do use variations in spacing and have for years, and this is also derived from our experience in passenger tires where this is a very common and universal approach to reduction of annoyance in this case.

Mr. BERLAND. By regular spacing, do you mean between the treads or around the circumference?

Mr. LIPPMANN. Around the circumference, yes. What you can do that way is spread the frequencies, avoid frequency concentrations. But you can't affect the overall energy level, and as a matter of fact, it is even adverse as far as decibel weighting is concerned, because it tends to move the frequencies up when it spreads and this is weighted adversely by the decibel scale.

Mr. BERLAND. Then if it's a randomized pattern, can't you eliminate the siren sound?

Mr. LIPPMANN. We certainly try to do that, and what we have on the road at the present time from all reputable commercial manufacturers—those who can carry out studies of this sort—are tires that are made that way.

Mr. BERLAND. Passenger tires?

Mr. LIPPMANN. Trucks, as well.

Mr. BERLAND. Well, apparently they are not being used widely.

Mr. LIPPMANN. No. This is as far as the advantage will go from that kind of approach. If they didn't have this type of spacing, it would be much more in line than they are. But this is a limit that we have come to at the present time. It doesn't mean it's an unsatisfactory product, from the viewpoint of EPA.

Mr. BERLAND. I notice you talked of noises of tires on road surfaces. I wonder whether you have done, or are contemplating doing, research in terms of imperial tire noise?

Mr. LIPPMANN. Oh, yes, by all means. This is continued work for all of the companies, and always has been done in the past.

Mr. BERLAND. Do you see any breakthroughs in the future?

Mr. LIPPMANN. We haven't had any reports of breakthroughs. As you know, we are separate companies, and we really can't act in constraint of trade and pool detailed information, except that information that does not come that way.

So anything that would be used for developing products, I am sure we would not know—those in one company would not know what is going on in another company.

The general sense that I get from talking to people is that there is no immediate breakthrough there.

Mr. ELDRED. I notice you had about 15 dbA, assuming smoothness. Do you have any feeling about how far one might be able to go in making a practical tire to reduce that 15 dbA?

Mr. CURTISS. That tire was not smooth with no tread, it was molded with a smooth tread, but just lacking design. But it had a full tread.

And the contour, or the radius, was representative of standards over the truck tires, so it represented what we thought was a bottom limit on what we could do. It's not a practical tire.

Mr. ELDRED. It has a smooth surface?

Mr. CURTISS. Right, a smooth surface with no design in it. That gives us a bottom limit, but it's not a practical tire.

To your other question, how far we can go on lug tires, basically I think the data we show represents the state of the art at the present time, and that is employing all of the varying spacing methods that we know how to do in the tire, and the compounding we know how to do.

One of our main purposes was to show the data we feel represents the state of the art for traction type tires.

Mr. ELDRED. I wonder if you could speculate on not necessarily a lug design, but a tire that would fulfill the purpose—how much more reduction one might expect 10 years from now—something like that.

Mr. CURTISS. The only approach we really have is to do things we have done in passenger tires and Seymour mentioned that some of these things tend to drive frequencies to a higher range and it's more objectionable. But this is putting more blading in a truck tire that doesn't have a great deal of blading. But the limitations are materials, because if you go to too much blading, you get irregular wear and this would generate higher noise levels in the worn state.

So it's a matter of developing compounds which still maintain performance levels we need and tread wear and traction.

Of course, as we mentioned before, we are working on compounds continuously. I don't know if I can guess and give you a level. I don't think I can.

Dr. JOHNSON. First I have a question for the Chairman. Have you received similar reports on passenger car tires?

Dr. MEYER. At the Chicago hearing, there was rather extensive discussion of the entire tire matter which was provided and contained in the record of that hearing.

Dr. JOHNSON. Does this include cases where your dynamic forces overcome your static coefficient forces, as in squealing?

Dr. MEYER. That was discussed, as I recollect.

Dr. JOHNSON. In the event it was not in the record, EPA should have it in the report, that there is considerable research on the entire problem. It's just not applicable to truck tires.

Mr. LIPPMANN. Tire squeal has been a matter of importance to the industry. The public has the impression that when tires squeal, they are unstable for control of the vehicle. So for that reason, if for no other, we would want to eliminate that particular property, and we have, in large part.

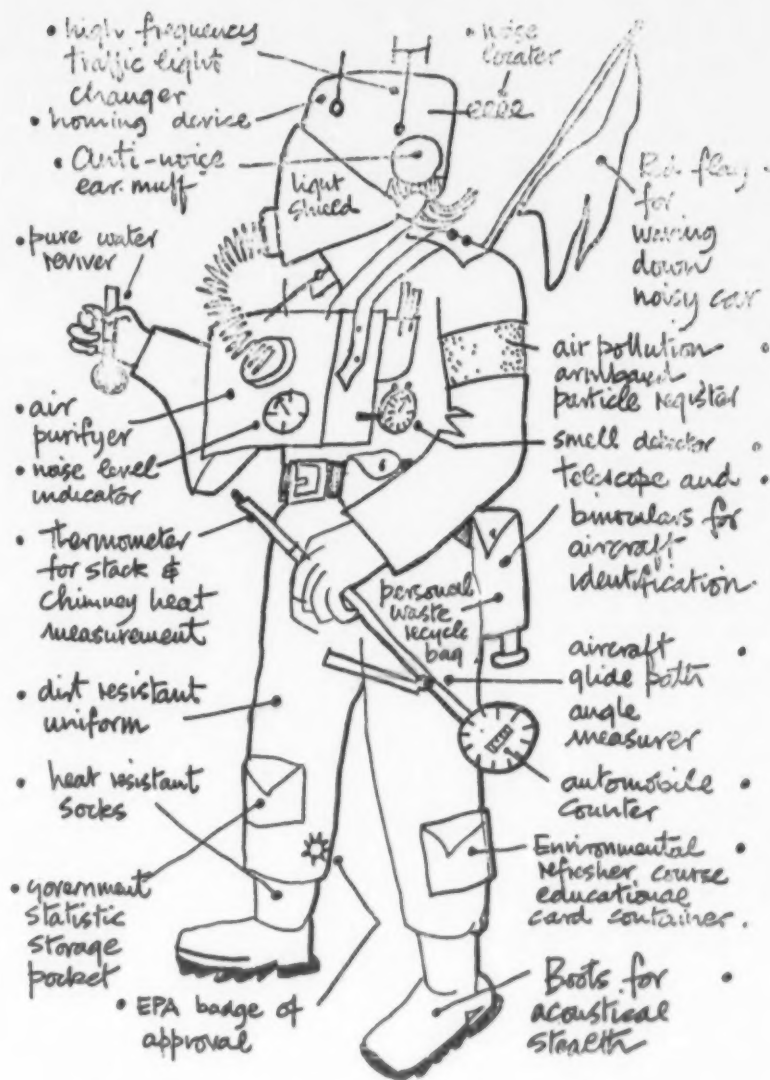
Dr. MEYER. Well, I find once again that the information you presented is going to be most useful to us as we come to this point in time when we are going to have to come up with a total vehicle noise standard measurement method which will fit into the charter which the Congress is going to give us. We will want to work closely with you, and the automotive industry as well to try to come up with a system that meets some of the problems you described.

Thank you again for bringing your colleagues, and giving us this very informative discussion.

Mr. LIPPMANN. Thank you.

Dr. MEYER. At this point, being almost 12 o'clock, we will recess for 1 hour. We will reconvene promptly at 1 o'clock, so we may hear all of the afternoon witnesses.

(Whereupon, at 11:55 a.m., the hearing was recessed for lunch, to be resumed at 1 p.m. the same day.)



POLICEMAN of TO-MORROW

• Burdis '71



TRUCK TIRE NOISE

RMA

TRUCK TIRE NOISE
PRESENTATION
TO THE

OFFICE OF NOISE ABATEMENT AND CONTROL
OF THE
ENVIRONMENTAL PROTECTION AGENCY
HEARING

WASHINGTON, D.C.

NOVEMBER 12, 1971

BY THE

RUBBER MANUFACTURERS ASSOCIATION
ON BEHALF OF
UNITED STATES TIRE MANUFACTURERS

ABSTRACT: This presentation summarizes the state of the art of truck tire sound testing as it exists at the present time. It includes a discussion of instrumentation, test procedure, tire and test parameters, methods of analysis, test results and conclusions.

INTRODUCTION

In recent years with the advent of governmental and public concern with various forms of pollution, truck noise has been established as one source of environmental noise pollution. The tire industry, in an attempt to determine the contribution of tires to the total vehicle sound level, has been evaluating tires for their sound characteristics for several years.

Truck tire sound evaluation has been accomplished in the past in many various ways -- subjective comparison of tires, dynamometer testing and instrumented analysis. Considerations in establishing a test method are conformity to present test standards, simplicity, repeatability, pertinence and economy. Mindful of these factors, the industry has been using an instrumented "coast-by" truck tire sound test consistent with established SAE standards for measurement of overall vehicle sound level.

INSTRUMENTATION (Figure 1)

Instrumentation generally used to perform truck tire sound tests includes the following items:

1. A precision sound level meter which satisfies the Type I requirements of American National Standards S1.4-1971.
2. A magnetic tape recorder.
3. A set of one third octave band filters or other analyzing equipment.

TEST SITE (Figure 2)

The test site has been defined as a flat, cleared area free of sound absorbing and reflecting objects 100 feet in radius from the location of the microphone. The microphone itself is 50 feet from the center-line of the path of vehicle travel and 4 feet above the ground plane. The distance of 50 feet has been accepted as a compromise standard for all vehicles, including passenger cars. A greater distance could be used for measuring tire sound, but the

size of the test site become impracticable. The vehicle path should be relatively smooth, dry and free from any extraneous material such as gravel. The effect of different road surfaces is shown in the accompanying test results. The test zone is approximately 200 feet long on the vehicle path, extending 100 feet before and after the microphone position.

TEST VEHICLE (Figure 3)

A typical test vehicle has been a flat-bed, two-axle truck, with one steering axle and one powered axle. It is 94" wide, with at least 36" overhang from the rear axle to the rear of the bed, and a 48" clearance between the road and the bottom of the bed. The vehicle is chosen to be "acoustically quiet" and equipped with quiet tires on the front axle. The rear axle bears four test tires dual mounted at their rated load and inflation.

TEST PROCEDURE

A typical test is as follows:

1. The test vehicle coasts through the test site, with the clutch disengaged before the vehicle reaches the recording zone. This minimizes the effects of engine and other mechanical noise.
2. The test vehicle coasting speed is approximately 30 mph.
3. The test vehicle makes at least three "coast-by's".
4. The wind velocity at the microphone is less than 12 mph.
5. The ambient temperature has not been controlled. Test experience has shown that a temperature difference of 30 degrees F. produces very small changes in tire sounds.

METHOD OF NOISE ANALYSIS

There are many different methods for analyzing tire sounds. Tire manufacturers have been using measurements of sound pressure level (SPL), A-weighted (dB), slow response as a simple tool in evaluating tire sounds. However, other tools such as spectral analysis and time delayed analysis have been used for evaluation. The following offers some general comment on several of these methods.

A. dB(A)

The dB(A) measurement yields a single number that can be obtained in the field.

With the dB(A) measurement, a choice between fast response (0.2 second) and slow response (1.0 second) for the time constant of integration must be made. Figure 4 illustrates how the instantaneous sound level during a typical "pass-by" test increases, reaches a peak, and then decreases. It also shows that fast response produces higher dB(A) levels by integrating over a smaller portion of the peak. The mean difference between the fast and slow dB(A) values for over 100 "pass-by" tests was 1.05 dB(A) with a standard deviation of 0.060.

The differences between fast and slow response are as follows:

1. The dB(A) slow response produces good correlation between different test groups on different concrete test sites with different measurement equipment.
2. The dB(A) slow response has produced better correlation (0.915) with subjective ratings than dB(A) fast response (0.89).
3. The dB(A) fast response corresponds to current standards for measuring truck noise.
4. The ease of measuring causes the slow response to be more desirable.

A final point in favor of slow response is that studies in psychoacoustics have proven that a signal of 0.2 seconds (as in fast response) can be recognized under ideal conditions, but it is highly unlikely that a person could remember the events of such a short time duration over a 10-second pass-by.

B. Spectral Analysis

Spectral analysis decomposes the sound into its frequency components. The advantages of such an analysis are as follows:

1. It defines the problem frequencies, and facilitates the application of a mathematical model for studying the problem area.

2. It is applicable to and facilitates the analysis of complex sounds.
3. It helps to identify the tonal, ringing characteristics of the tire.

Certain disadvantages to spectral analysis are:

1. It requires longer time for data analysis.
2. It is more complex. Because of its sensitivity to equipment and handling procedures, tests by different testing groups often lead to different answers.
3. It does not yield a single number.
4. Results cannot be obtained in the field.

Narrow band spectral analysis such as power spectral density (PSD) is useful for defining problem areas. It is primarily an engineering tool. The economics and the complexity of interpretation involved favor it remaining only an engineering tool.

Figure 5 illustrates a PSD plot of a truck tire, "coast-by" test.

A one third octave band analysis, as shown by Figure 6, is a good compromise between narrow band and octave band analysis. A one third octave band is easier to analyze than narrow band, but more detailed than octave band. Inconsistencies, such as the doppler shift, do not appreciably affect its results as in narrow band analysis. In addition, it relates more closely to the existing state of the art for the physiology of human response to noise. Present instrumentation technology and standardization are well established for one third octave analysis.

There are two principle methods of data handling for one third octave band analysis. One method involves sweeping a band and plotting the peak levels for each one third octave band. The second method simultaneously integrates all bands at some point in time, for example, at the peak value. Both methods have proven to be very useful in interpreting data.

TONALITY

The primary reason that the tire industry has not subscribed to dB(A) as an exclusive measurement is because of its deficiency in measuring tonality, or the lingering type of tire noise that is apparent long after the truck passes. Subjective comparisons of tonal and non-tonal tires have indicated that tonality is one of the major factors affecting subjective response. Hearing trucks from a distance of over 200 feet away suggests the importance of tonality.

The following points are being studied to establish their relationship between tonality and subjective reactions:

1. dB(A) at some specific time after the peak level at pass-by.
2. A one third octave analysis at the peak level at "coast-by" supplemented with some type of band weighting.
3. A one third octave analysis at some specific time after the peak at "coast-by".

Figure 7 is a good example of why tonality must be considered in a complete tire sound analysis. The frequency is plotted against the decibel level using a two second time constant of integration. The time intervals analyzed are from one second before to one second after pass-by, and from one second after to three seconds after pass-by. The upper two plots (-1 to +1 seconds) represent the typical time interval analyzed in a "coast-by" test. It can be seen that these two plots, for a quiet and a tonal tire, are similar. The only peak that appears on the plot of the tonal tire is 4dB at 430 hertz and is 4dB above the adjacent bands. These tires would have similar dB(A) ratings if the peak level were the only time interval analyzed. Now consider the lower two plots, which represent the same pass-bys, although in the interval from one to three seconds after pass-by. The tonal tire has two peaks, a primary one at 375 hertz and a secondary one at 700 hertz, while the quiet tire has a smooth spectrum. It is only with this additional information that tonality becomes apparent and the relative sound characteristics of these tires are realized.

ANALYSIS OF VEHICLE AND TIRE SOUNDS (Rib Tire)

Spectral analysis has been very useful in separating vehicle and tire sounds as well as in characterizing sounds from different types of tires.

Figure 8 shows the spectrum of a set of quiet rib tires both with the vehicle coasting and with the vehicle under power. The area under the "coast-by" curve appears to be attributed to tire sound, and is the minimum level in this test. The area under the "power-by" curve represents the base sound level for the vehicle equipped with quiet rib tires. As the frequency increases, the two curves approach each other. The truck sounds predominate at the lower end of the frequency spectrum; the tire sounds at the higher end. The sound level below 250 hertz can be attributed primarily to the vehicle, between 250 and 800 hertz to a combination of tire and vehicle sound, and above 800 hertz to an increasing domination of tire sound. This plot is typical of the contributions of vehicle and tire sounds to the total sound level of the vehicle.

Figure 9 shows the spectrum of a set of lug tires on the same vehicle for the coast-by and powered operation. It can be seen that the "power-by" curve closely parallels the vehicle base sound level up to 315 hertz, indicating the vehicle sounds dominate. Beyond 315 hertz, the "power-by" curve parallels the "coast-by" curve as the tire sound becomes the greater contributing factor. Again this is typical of the characteristics of lug tires, which are much louder than rib tires.

SOUND LEVELS OF VARIOUS TYPES OF TIRES

Figure 10 shows how the sound level varies with tread design. A smooth tread tire produces a low amplitude, flat spectrum. When circumferential grooves are cut in the tread, the sound level appears to increase within the frequency bands from 400 through 1250 hertz. The addition of sawtooth grooves, which are popular in commercial rib-type tires, causes moderate peaks such as the one shown at 500 hertz. These peaks differ from one rib-type tire to

another, as they are dependent on the tread design. In the tire illustrated, the frequency of the peak is a function of the number of sawtooths in the tread design.

The lug-type designs exhibit more pronounced peaks than the rib-type designs. For the example on the figure, the 250 hertz fundamental is caused by the repetitive spacings of the design pattern in the tire. The secondary peak at 315 hertz indicates a possible frequency modulation due to variations in pattern spacing. The second harmonic at 500 hertz is due to the number of lugs per design pattern. The third peak at the 800 hertz band can be traced to the number of serrations per design pattern. Not all tire sound spectra are as easily traced back to the tread pattern as this example would indicate. Random serrations and pattern spacing cause non-harmonically related content which are difficult to analyze.

TEST RESULTS

SOUND LEVEL VS DISTANCE OF MICROPHONE FROM SOUND SOURCE

As the distance from the microphone to the vehicle path increases in a free field the dB(A) level decreases at the rate of 6 dB per doubling of the distance. As shown on Table 1, this number may vary in actual test situations.

ROAD SURFACE AND SOUND GENERATION

There is a very significant difference between smooth brushed concrete and asphalt road surfaces in both the dB(A) level generated and the peak value spectrum. The smoother concrete leads to higher dB(A) levels. Figure 11 represents the effects of road surface on the spectrum of a typical set of test tires.

SOUND LEVEL VS VEHICLE SPEED

As the vehicle speed increases, the sound level also increases. By plotting the dB(A) level against the log of the vehicle speed for six different kinds of tread patterns, an approximate linear relationship was established, as shown on Figure 12. It should be noted, however, that the curves all have

different slopes, which signifies that various types of tires react differently to speed. The sound levels all increase with speed, but the rate of increase varies from pattern to pattern.

SOUND LEVEL VS LOAD AND INFLATION

Decreases in load or increases in inflation will reduce the tire deflection and also the sound level. This is shown in Tables 2 and 3. In general, the industry has tested at the rated maximum load and inflation. This yields highest dB(A) levels.

LOCATION OF TIRES ON THE VEHICLE

A test was performed on a semi-tractor trailer rig to determine:

1. Whether there is an advantage in using this vehicle instead of a flat-bed truck.
2. Whether tire sounds can be obscured at any axle position on the tractor or trailer.
3. The effect of doubling the number of tires.

The results of this test are shown in Table 4. Other than on the steering axle, the vehicle had 12 test tire positions: 4 drive axle, 4 front trailer and 4 rear trailer. With lug tires on the drive axle and smooth tires on all other positions, the dB(A) level was 81.0 on concrete. By replacing the smooth tires on either the front or rear trailer axle with lug tires, the effect is an identical increase of 3 dB(A) to 84.0. This shows that tire sound cannot be reduced by placing the louder tires on any axle position. It also shows that in this test by doubling the sound source from 4 to 8 lug tires, the maximum theoretical increase of 3 dB(A) was attained. However, it should be stressed at this point that the vast majority of test results indicate only a 2 dB(A) increase per doubling of the number of loud tires. The particular test cited was for a vehicle shorter than those normally encountered in commercial use. For longer vehicles, the axles are sufficiently spaced so that the tires act as two separate sound sources.

Figure 13 shows that if there is a 0.4 second time lag between the drive and trailer tires, the first sound will already be decaying before the second sound has peaked. Therefore, although the two sources are additive, the relative effect of the first source is lessened, and the total sound level for the two sources is approximately 2 dB(A) higher than for the single source.

MINIMUM SOUND LEVEL

It is important to establish a minimum tire sound level so that a relative scale can be developed. The tire sound is created predominantly by grooves and serrations in the tread surface. Consequently, a set of smooth tread tires was used to establish the minimum level. Size 10.00-20 Load Range F tires produced a dB(A) level of 65.9 on asphalt and 66.9 on concrete. By cutting straight circumferential grooves in the tread, the dB(A) levels were increased to 67.3 and 68.2 respectively. These results are reported in Table 5.

SOUND LEVEL VS TIRE SIZE

Table 6 shows the relationships between the levels of 10.00-20 and 8.25-20 tire sizes at their rated loads and inflations. Even though the smaller tires revolve faster at the same vehicle speed, their dB(A) levels are only slightly lower than for the larger tires.

SOUND LEVELS OF TUBELESS AND TUBE-TYPE TIRES

In testing 11-22.5 tubeless rib and lug tires against their 10.00-20 tube-type equivalents, little difference was apparent between the tires. Since these tires are generally produced in similar molds, the size of the tread elements and pattern arrangements are identical and, therefore, it was expected that the results would be similar. (Table 7)

SOUND LEVELS OF RADIAL AND BIAS PLY TIRES

At the present time the question of radial bias ply construction is unresolved. Although the dB(A) level of the radial lug tires was lower, the

dB(A) level of the radial rib tire was not lower than the corresponding bias rib tire. The relative standing can only be established by building both constructions in the same mold and testing. This is being planned as a future program. The radial and bias test results are shown with the rib vs lug test results on Table 5.

SOUND LEVELS OF
RIB AND LUG-TYPE TIRES

It has been well established by test data that lug-type tires are the major contributor among truck tire sounds. New rib-type tires generally produce sound levels at about 70 dB(A) while new lug-type tires produce levels at about 80 dB(A). (Table 5) This difference is attributable to the large lateral elements of the lug tread as opposed to the circumferential elements of the rib tread. It is important to recognize lug tires are specially designed to give the vehicle operator maximum traction and mileage when applied to drive-axle positions of large tractor-trailer units. Tests on low friction coefficient surfaces show that lug tires provide up to 15% more lateral traction, 15% more driving torque, and 100% better traction on snow and ice than rib-type designs. Lug tires also operate as much as 15° F. cooler than rib tires under normal highway conditions. Because of the added rigidity of the larger tread elements, it is practical to manufacture a lug tire with as much as 60% more tread depth. These and other factors can increase original tread mileage by as much as 150% over rib type tires on the drive axle position of tractor-trailer rigs.

These characteristics are of major concern to vehicle operators in terms of safety and economy. Unfortunately, there are no known techniques for reducing sound levels of lug tires to those of rib tires without seriously impairing traction and treadwear.

SOUND LEVEL AND TIRE WEAR

As a general rule, test results have shown that worn tires are louder than new tires. The degree to which the sound level increases is different for different tread patterns. Sound levels are dependent on the tread pattern changes as the tire wears, on the increase in flatness of the tread, and on any irregular wear patterns that could develop. The last two factors are influenced by the vehicle operator rather than the tire manufacturer. This makes it difficult for tire manufacturers to control sound levels of worn tires. There is a point in a tire's life where it produces the highest noise level, but whether a general rule can be applied to predict when this will occur or what the level will be is still questionable. Table 8 shows the sound level of certain new tires, 25% worn tires, and 50% worn tires. Of these, the 25% worn tires had the highest sound levels, but some other percentage of wear could result in even higher levels.

SUMMARY:

1. Sound pressure level, A-weighted (in dB) is a single number which can be obtained in the field, correlates with subjective analysis and gives consistent results among different test sites.
2. Slow meter response is favored over fast because it further improves the correlation with subjective ratings and the consistency of test results.
3. Spectral analysis is a more complex tool which can be of great use in defining specific problem areas, separating tire sound from vehicle sound, and further elaborating on the differences among various types of tires.
4. Tonality is an important characteristic of tire sound related to subjective reaction which must be evaluated by some form of spectral analysis. This area will require further study to find the best solution.

5. Ambient temperature does not significantly affect sound pressure levels.
6. The dB(A) level decreases approximately at the rate of 6 dB(A) per doubling of the distance between the microphone and the vehicle.
7. Smooth concrete yields higher sound levels than asphalt.
8. Sound level increases as vehicle speed increases.
9. Sound level increases with increased tire deflection.
10. Tire sound cannot be reduced by the choice of selective axle positions.
11. Doubling of the number of tires increases the sound level by 2 to 3 dB(A).
12. Smooth tread tires produce the lowest observed sound levels of 63.9 dB(A) on asphalt and 66.9 dB(A) on concrete.
13. Sound level of smaller tires at their rated load is slightly lower than that of larger tires at their rated load.
14. Tubeless and tube-type tires produce the same sound levels.
15. It has not been determined whether radial tires may produce lower sound levels than bias tires. Further study is needed.
16. Rib tires exhibit much lower sound levels than lug tires, but safety and economics favor lug tires over ribs in certain applications.
17. Worn tires create higher sound levels than new tires, but some questions still remain in defining the degree and condition of wear for noise standards.



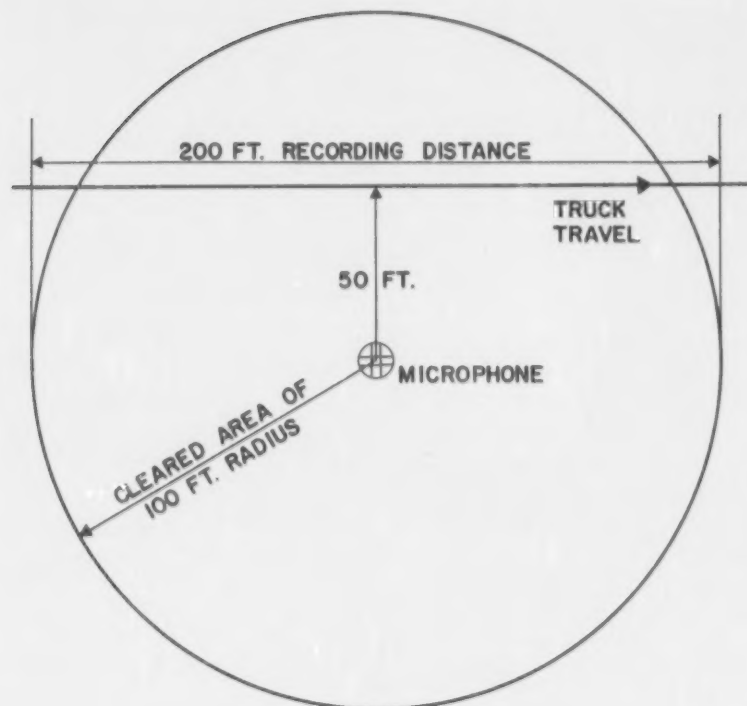
TEST SITEFIGURE 2



FIGURE 4

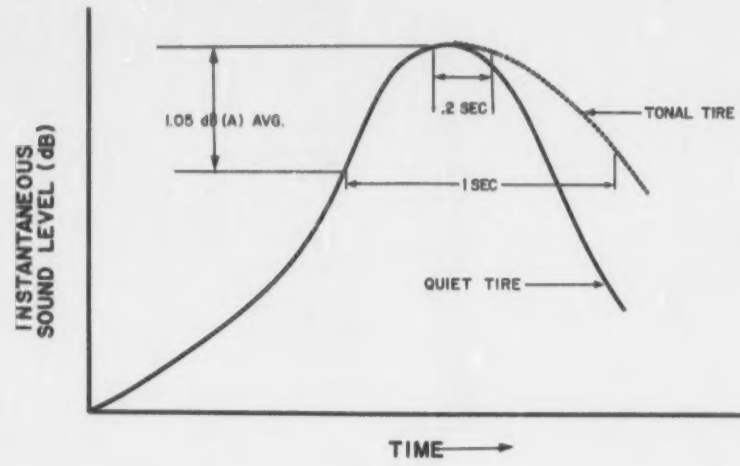
INSTANTANEOUS SOUND LEVEL DURING A TYPICAL COAST-BY TEST

FIGURE 5

POWER SPECTRAL DENSITY PLOT
(1 HERTZ BAND WIDTH)

10.00-20 LR-F LUG TIRE
4760# 75 PSI (COLD)

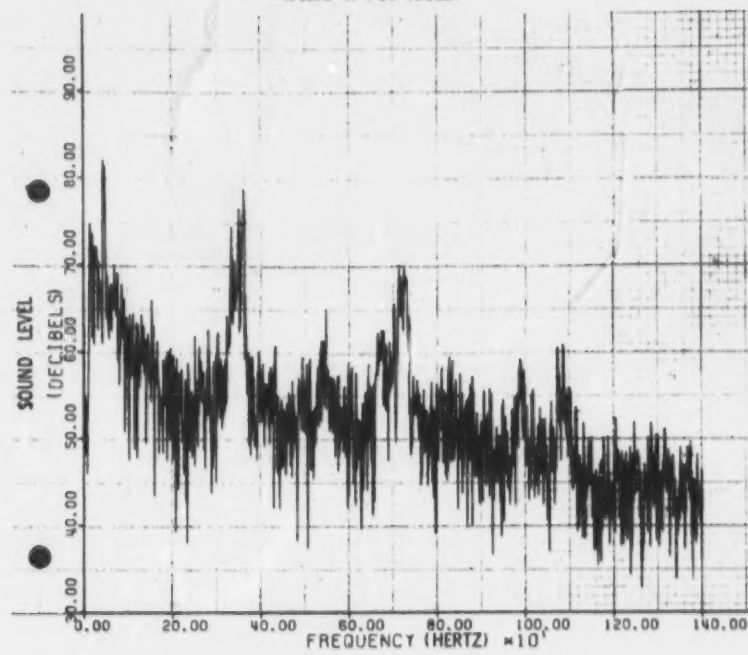


FIGURE 6

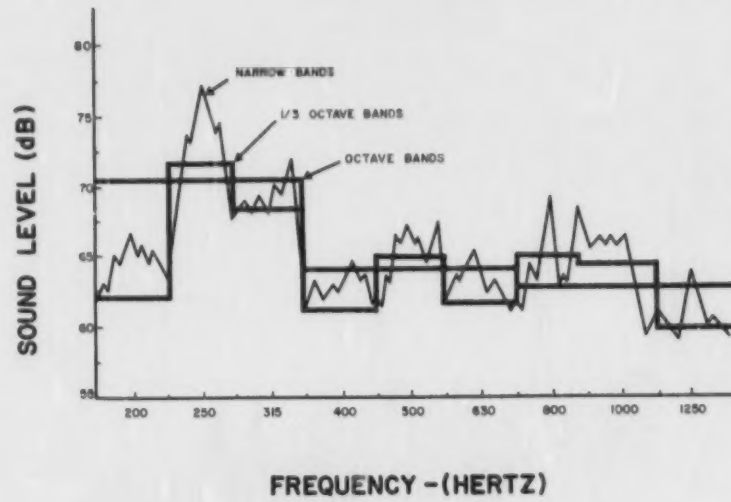
TYPICAL SPECTRAL ANALYSIS OF TRUCK TIRE SOUNDS

FIGURE 7

**SPECTRAL CHARACTERISTICS OF TONAL TIRE
AT VARIOUS TIME INTERVALS**

10.00-20 LR-F TIRES
4760 #@ 75 PSI (COLD)

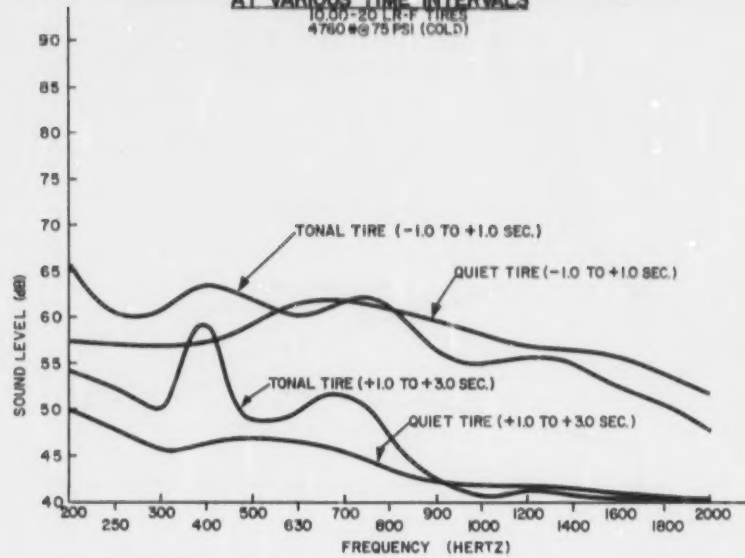


FIGURE 8

ANALYSIS OF VEHICLE AND TIRE SOUNDS

10.00-20 LR-F RIB TIRE
4760 # @ 75 PSI (COLD)

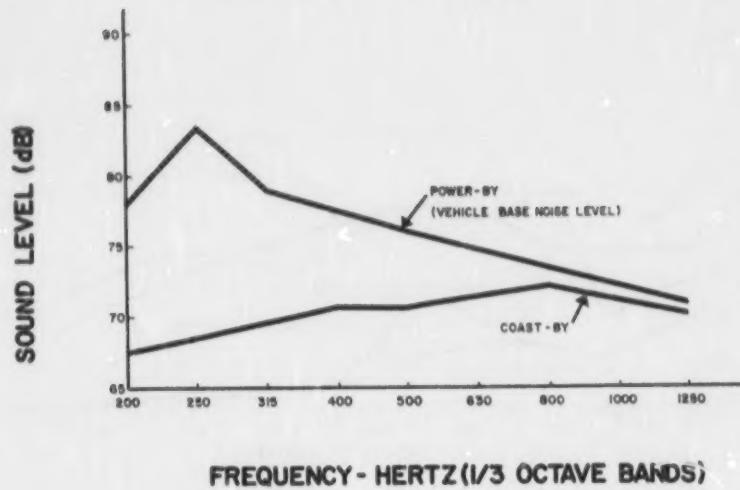


FIGURE 9

ANALYSIS OF VEHICLE AND TIRE SOUNDS

10.00-20 LR-F LUG TIRE
4760 # @ 75 PSI (COLD)

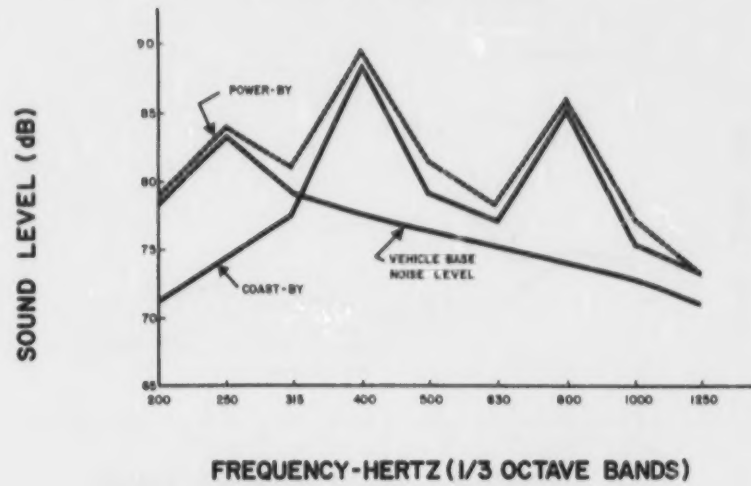


FIGURE 10

SOUND LEVELS OF VARIOUS TYPES OF TIRES

10.00-20 LR-F TIRES
4760 # 6 75 PSI (COLD)

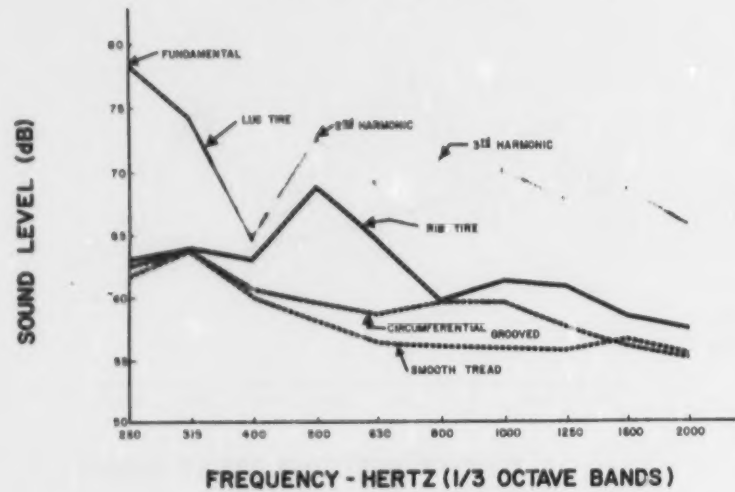


FIGURE 11

ROAD SURFACE AND SOUND GENERATION

10.00-20 LR-F LUG TIRE
4760 # @ 75 PSI (COLD)

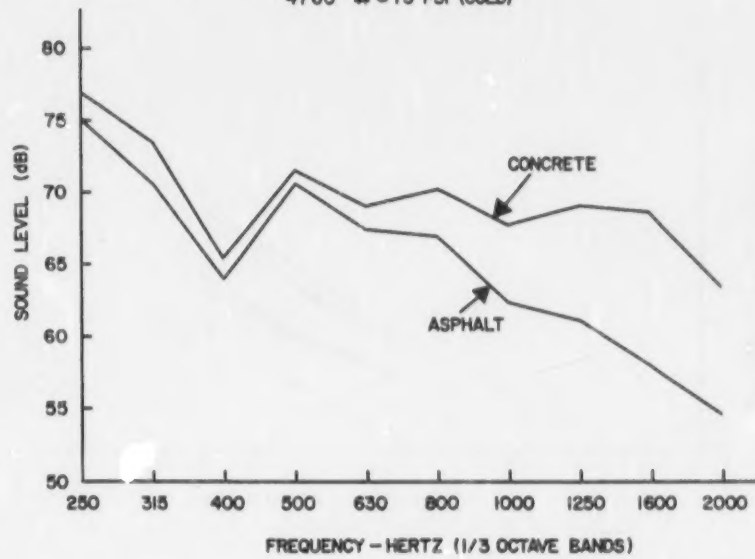


FIGURE 12

SOUND LEVEL VS. VEHICLE SPEED

10.00-20 LR-F TIRES
4760 # 8 75 PSI (COLD)

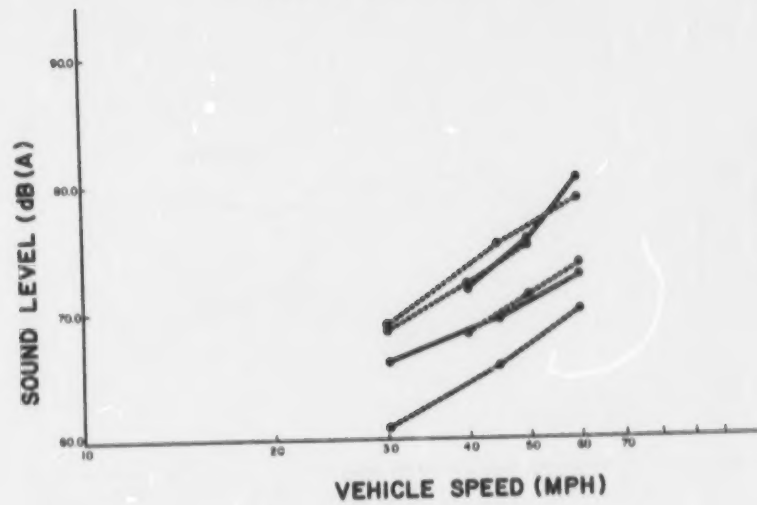


FIGURE 13

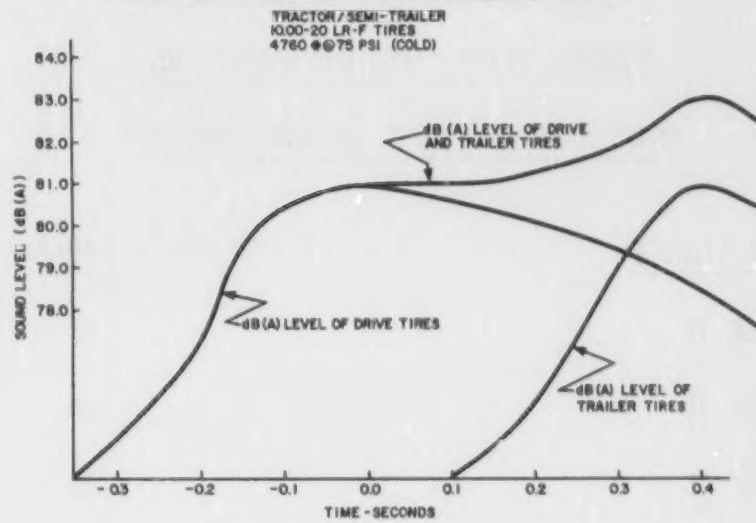
EFFECT OF TIME DECAY ON TIRE SOUND LEVEL

TABLE 1

SOUND LEVEL VS DISTANCE OF
MICROPHONE FROM SOUND SOURCE

<u>DISTANCE</u>	<u>dB(A)</u>
100 ft	82
60 ft	86
50 ft	88
45 ft	89
40 ft	90
20 ft	95

TABLE 2SOUND LEVEL VS TIRE LOADS

(INFLATION PRESSURE CONSTANT)

10.00-20 LR-F TIRES

75 PSI (COLD)

<u>TIRE TYPE</u>	<u>TIRE LOAD</u>	<u>dB(A) LEVEL - SLOW RESPONSE</u>	
		<u>ASPHALT</u>	<u>CONCRETE</u>
RIB	1600#	69.3	72.2
RIB	3880#	70.4	72.7
RIB	4760#	70.7	72.4
LUG	1600#	72.2	75.6
LUG	3880#	77.0	80.8
LUG	4760#	77.4	81.6

TABLE 3SOUND LEVEL VS TIRE INFLATION

(TIRE LOAD CONSTANT)
10.00-20 LR-F TIRES
4760# TIRE LOAD

<u>TIRE TYPE</u>	<u>INFLATION</u>	<u>dB(A) LEVEL - SLOW RESPONSE</u>	
		<u>ASPHALT</u>	<u>CONCRETE</u>
LUG	90 PSI	76.2	80.3
LUG	75 PSI	76.7	80.6
LUG	60 PSI	77.2	81.5

TABLE 4

LOCATION OF TIRES ON THE VEHICLE

TRACTOR/SEMI - TRAILER
 10.00-20 LR-F TIRES 4760# 75PSI (COLD)
 (12 TEST TIRE POSITIONS)

<u>TIRE TYPE</u>	<u>LOCATION</u>	<u>dB(A) LEVEL - SLOW RESPONSE</u>	
		<u>ASPHALT</u>	<u>CONCRETE</u>
SMOOTH SMOOTH	TRACTOR DRIVE TRAILER FRONT & REAR	71.9	72.7
LUG SMOOTH	TRACTOR DRIVE TRAILER FRONT & REAR	77.4	81.0
LUG LUG SMOOTH	TRACTOR DRIVE TRAILER FRONT TRAILER REAR	79.2	84.0
LUG SMOOTH LUG	TRACTOR DRIVE TRAILER FRONT TRAILER REAR	79.0	84.0
LUG LUG	TRACTOR DRIVE TRAILER FRONT & REAR	80.0	85.4

TABLE 5

RELATIVE SOUND LEVELS OF NEW TRUCK TIRES

10.00-20 LR-F TIRES
4760 #0 75PSI (COLD)

<u>TIRE TYPE</u>	<u>(dB(A) LEVEL - SLOW RESPONSE</u>	
	<u>ASPHALT</u>	<u>CONCRETE</u>
SMOOTH TREAD	65.9	66.9
SMOOTH TREAD CIRCUMFERENTIAL GROOVED	67.3	68.2
BIAS PLY RIB	68.4	70.5
RADIAL PLY RIB	69.9	71.3
BIAS PLY LUG	75.8	79.9
RADIAL PLY LUG	72.1	75.7

TABLE 6SOUND LEVEL VS TIRE SIZE

825-20 LR-F 3950 @ 90 PSI (COLD)

1000-20 LR-F 4760 # @ 75 PSI (COLD)

<u>TIRE TYPE</u>	<u>SIZE</u>	<u>dB(A) LEVEL - SLOW RESPONSE</u>	
		<u>ASPHALT</u>	<u>CONCRETE</u>
RIB	8.25-20	68.0	69.3
RIB	10.00-20	69.1	71.7
LUG	8.25-20	74.5	78.5
LUG	10.00-20	75.8	79.9

TABLE 7

SOUND LEVELS OF TUBELESS AND TUBETYPE TIRES

11-22.5 LR-F VS 10.00-20 LR-F TIRES
4760 #0 75 PSI (COLD)

<u>TIRE TYPE</u>	<u>dB(A) LEVEL - SLOW RESPONSE</u>	
	<u>ASPHALT</u>	<u>CONCRETE</u>
RIB TUBELESS	68.5	71.5
RIB TUBETYPE	68.4	70.5
LUG TUBELESS	75.4	80.1
LUG TUBETYPE	75.8	79.9

TABLE 8
SOUND LEVEL VS TIRE WEAR

11-22.5 LR-F TIRES
4760 #@ 75PSI (COLD)

TIRE TYPE	STAGE OF WEAR	dB(A) LEVEL - SLOW RESPONSE	
		ASPHALT	CONCRETE
RIB	NEW	68.5	71.5
RIB	25%	72.0	75.5
RIB	50%	72.8	73.7
LUG #1	NEW	75.4	80.1
LUG #1	25%	80.0	83.7
LUG #1	50%	76.6	81.6
LUG #2	NEW	76.6	77.4
LUG #2	25%	82.6	83.7
LUG #2	50%	81.2	83.1

TECHNICAL REPORT STANDARD TITLE PAGE			
1. Report No. OST-ONA-71-1	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle A STUDY OF THE MAGNITUDE OF TRANSPORTATION NOISE GENERATION AND POTENTIAL ABATEMENT		5. Report Date November, 1970	6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Serendipity, Incorporated Eastern Operations Division Suite 701, 2001 Jefferson Davis Hwy. Arlington, Virginia 22202		10. Work Unit No.	11. Contract or Grant No. DOT-OS-A9-018
12. Sponsoring Agency Name and Address Department of Transportation Office of the Secretary Office of Noise Abatement Washington, D. C. 20590		13. Type of Report and Period Covered Final Report	
14. Sponsoring Agency Code		15. Supplementary Notes Volume II Measurement Criterion	
16. Abstract Evaluations of the effectiveness of transportation noise abatement require the use of a measure which relates individual and community reactions to transportation noise. Previous studies were examined to determine how well various measures predicted response to noise. A-weighted Sound Level (in dBA) and Noise Pollution Level (in dBA) were examined to determine their relationships to other measures and their prediction of reaction, i.e., loudness, annoyance, noisiness. The A-weighted sound level, on the average, correlated as well with subjective response as the other measures. Only for jet aircraft pure tones was there a significant predictive performance difference between Effective Perceived Noise Level (EPNL) and dBA, favoring EPNL. These differences were not considered important for this study since the correlations between dBA and subjective responses were generally greater than 0.90. Average community response measures have been developed for aircraft and motor vehicle noise. Using the aircraft Noise and Number Index and motor vehicle Traffic Noise Index data, the Noise Pollution Level was shown to correlate as well with average community response as both of the measures. Since Noise Pollution Level is compatible with the use of dBA for individual vehicles, its selection as a community measure complements the choice of dBA as a vehicle measure.			
17. Key Words noise, transportation noise, motor vehicle noise, aircraft noise, noise pollution, noise measurement, community response, individual reaction, criterion measures		18. Distribution Statement Availability is unlimited. Document may be released to the National Technical Information Service, Operations Div., Springfield, Va., 22151 for sale to the public.	
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APPENDIX OF TECHNICAL DATA

TO SUPPLEMENT THE RMA

PRESENTATION

TO THE

OFFICE OF NOISE ABATEMENT AND CONTROL

CONCERNING TRUCK TIRE NOISE

WASHINGTON, D. C.

NOVEMBER 12, 1971

1. Sound level versus Distance -

participated in a test coordinated by the SAE Truck Tire Noise Subcommittee which yielded the attenuation relationship: $SPL(dB(A)) = 26 \log(r_1/r_2)$. The data is summarized in a graph. A copy of this graph is enclosed.

2. Sound Level versus Speed -

Effect of Speed (Increase in peak dB(A) level from 50 to 60 mph)

Average of 3 sets of rib tires (New; 10.00-20)	+2.8
Average of 3 sets of cross rib tires (New; 10.00-20)	+3.0
One set of rib tires (New; 10.00-22)	+2.6
One set of rib tires (Worn; 10.00-20)	+1.7
Average of 2 sets of cross rib tires at reduced load (New; 10.00-20)	+3.2
One set of cross rib tires at equivalent deflection (New; 10.00-20)	+4.4
Average of all sets of rib tires	+2.6
Average of all sets of cross rib tires	+3.3

3. Sound Level versus Load (Constant Inflation Pressure)

The results reported here were obtained utilizing the preliminary SAE test procedure with the exception of the load and inflation pressure specification.

Tire	Change in Load (lbs.)	Change in Sound Level
Rib A	4760 to 3575 (-1185 pounds)	0.0 dB(A)
Crossbar C	4760 to 3760 (-1000 pounds)	-1.3 dB(A)
Crossbar D	4760 to 3575 (-1185 pounds)	-1.2 dB(A)

Sound Level versus Load (Constant Deflection)

Tire	Change in Load (lbs.)	Change in Sound Level
Rib A	4760 to 3760 (-1000 pounds)	-0.6 dB(A)
Crossbar C	4760 to 3760 (-1000 pounds)	0.0 dB(A)
Crossbar D	4760 to 3575 (-1185 pounds)	-1.2 dB(A)

4. Sound Level versus Ambient Temperature -

Effect of Temperature

	Change in Air Temp.	Change in Road Temp.	Δ Level (dB)
Rib Set	80° to 82°	82° to 107°	+0.1
Cross rib Set	70° to 84°	83° to 105°	-0.1
Cross rib Set	70° to 82°	83° to 87°	-0.4
Cross rib Set	70° to 88°	83° to 108°	-0.3
Cross rib Set	72° to 81°	84° to 104°	-0.1

5. Sound Level versus Road Surface -

The only data we have on the effect of road surface on sound levels is contained in the comparison of our measurements on new tires with the measurements made on the same tires at other test sites by other groups utilizing the preliminary SAE test procedure. This data was summarized in a report to the SAE Truck Tire Noise Subcommittee dated October 14, 1971.

6. Sound Level versus Condition of Wear -

Type of Tire	Average Increase In Sound Level
Rib	+2.5 dB(A)
Crossbar	+4.2 dB(A)

This table shows the average increase in the peak dB(A) sound level exhibited by a worn tire versus a new tire in the same design when measured according to the preliminary SAE testing procedure.

7. Truck Tire Spectral Characteristics -

Typical spectra for one rib tire and three crossbar tires are enclosed. These spectra were produced by performing a 1/10-octave analysis of passby tests run according to the preliminary SAE standard test procedure. The wide variation in the height and position of the peaks in the spectra is quite evident. The major peak exhibited by each tire is as follows:

Rib	A	64.7 dB at 470 Hz
Crossbar	C	72.0 dB at 360 Hz
Crossbar	D	69.9 dB at 220 Hz
Crossbar	E	76.1 dB at 260 Hz

These variations in the spectral distributions of the sound emitted by various tire designs makes it impossible to use spectral analysis for separating out the contribution of the tires to the total vehicle sound level without special testing. A second obvious difference between tires is the amount of tonality exhibited. For Rib A the main peak is only about 5 dB higher than the surrounding bands; while for Crossbar D, the main peak is about 15 dB higher.

8. The difference between "slow" and "fast" meter response was determined by analysing recorded truck tire noise tests run in accordance with the preliminary SAE testing procedure. The dB(A) "fast" response yielded higher results than dB(A) "slow". For rib tires the increase ranged from 0.50 dB to 0.63 dB. For crossbar tires the increase ranged from 0.48 to 1.33 dB. The results are summarized in the table below.

Tire Type	dB(A) "fast" - dB(A) "slow"		
	Average	Range	Standard Deviation
Rib	0.59	0.50 to 0.63	0.06
Crossbar	0.90	0.48 to 1.33	0.43
All Types	0.72	0.48 to 1.33	0.30

9. Effect of Multiple Axles -

We have not conducted any tests to determine the effect of multiple axles.

10. Performance Comparison of Rib and Crossbar Tires -

Wet-braking-traction tests were performed on a group of new tires including both rib and crossbar tires at our test track. The peak and slide traction coefficients were determined by braking the front wheels of the test vehicle and measuring the deceleration. The wet-traction tests were run on wetted Terrazzo Concrete. The tires were loaded to 4530 pounds. The load transfer during braking increased the load to 4740 - 4960 pounds. The relative values of the braking-traction coefficient for two rib tires and for two crossbar tires are included in this table.

Relative Wet-Braking-Traction Coefficient (Terrazzo Concrete)

Tire		Peak @ 20	Peak @ 50	Slide @ 16	Slide @ 46
Rib	A	100	100	100	100
Rib	B	95	96	89	84
Crossbar	C	102	106	105	108
Crossbar	D	103	108	105	108

11. Sound Level versus Tire Size -

A comparison was made of 10.00-20 and 10.00-22 tires having the same tread design. Both a rib design and a crossbar design were tested in this manner utilizing the preliminary SAE procedure for truck tire noise passby tests. Only new tires were tested. The 10.00-22 rib tires exhibited a sound level which was 0.8 dB(A) higher than the same design in 10.00-20 size. The 10.00-22 crossbar tires were 1.2 dB(A) higher than the 10.00-20 size. Both sizes were tested at a load of 4760 pounds. Presumably the 10.00-22 tires would have exhibited an even higher sound level if they had been tested at the rated load for a 10.00-22 tire.

12. Comparison of tubeless and tube type tires -

We have not yet conducted any tests to make this comparison.

13. Comparison of Radial and Bias Tires -

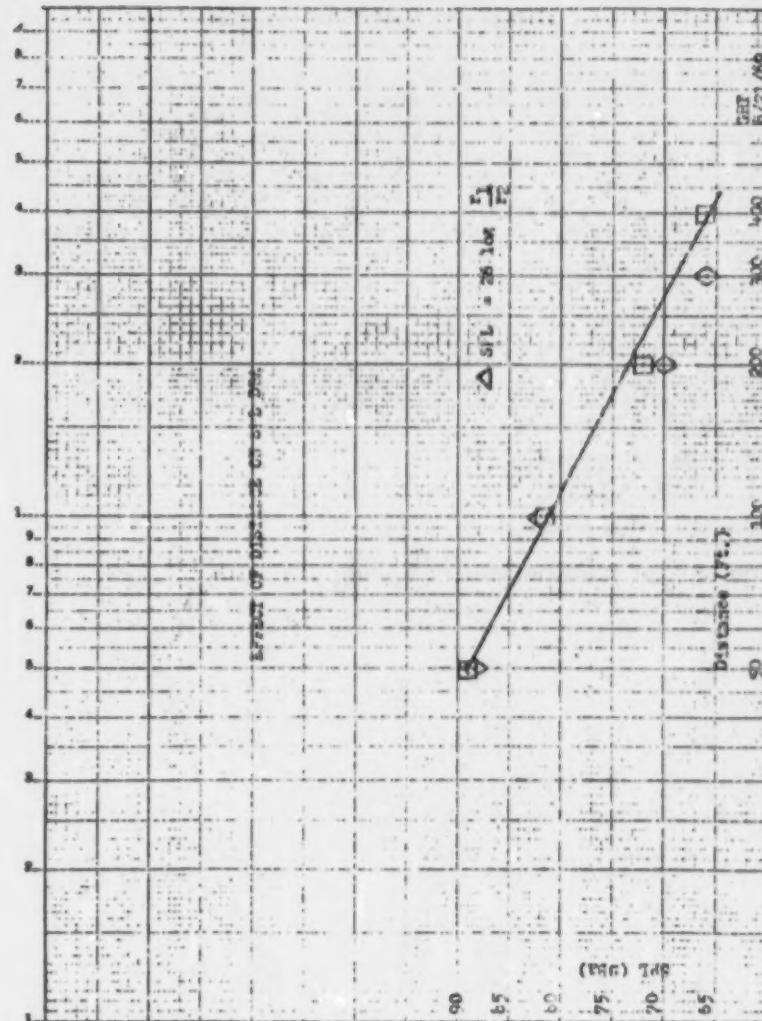
We have not yet conducted any tests to make this comparison.

14. Comparison of Rib and Crossbar Tires -

Both rib tires and crossbar tires were measured according to the preliminary SAE procedure for truck tire noise measurements. In 10.00-20 size, Crossbars C and D were 4.4 dB(A) higher than Rib A. In 10.00-22 size, Crossbar C was 4.7 dB(A) higher than Rib A. Unfortunately, we have no assurance that the background sound level produced by the test vehicle did not have a significant influence on the measurement of the rib tires. All that we really have for the rib tires is an upper limit for the sound level.

15. Minimum Tire Sound Level -

We do not have any data at this time which would contribute to the establishment of a minimum level for truck tire noise. Presumably the minimum level would be exhibited by a smooth tire or a straight-ribbed tire depending on the road surface.



PERFORMANCE DIFFERENCES - TRACTION

This traction testing was conducted on various surfaces with two tires of one design being tested. Traction testing can be inconclusive at times because many different and sometimes uncontrolled variables affect the results. The deceleration testing was performed with the test tires on the front. Only the front brakes were applied. Coefficients of friction were calculated from the deceleration values measured and then compared to a bogie tire. The variations in coefficients that resulted from testing on different days and at different times of the day (temperature effects) were corrected in Test No. 2 only. "Tractive Effort" testing was performed with two trucks coupled with a drawbar. After a slow, steady speed was reached, the lead truck engaged its transmission in second gear. The throttle was then opened until the tires started to spin. "Maximum Drawbar" values were recorded. At this point the tires were allowed to slip at a speedometer reading of 30 MPH, and the "Hi-Slip" values were recorded. The values obtained are again compared to a bogie tire. The tires were 10.00-20 12 PR Nylon conventional bias truck tires. For the deceleration tests the front tires were loaded to 5430 # per tire, and inflated to 85 PSI. The total vehicle load for all the testing was 19,800#. The vehicle had a c.g. height to wheel base ratio of 0.3.

R - Designates rib type
X - Designates cross bar
SX - Special Service

Test No. 1 Deceleration

Surface: Wet polished concrete $\mu = .10$

Tire:	Speed Condition	20 MPH		40 MPH	
		Peak	Slide	Peak	Slide
RA		1.00			
RE		.66*	.47	.64	.54
XB		.92	.90	.96	1.01
XC		1.06	.94	.93	1.02
SXD		.86	.84	.92	.88

Test No. 2 Deceleration

Surface: Wet terrazo concrete $\mu = .30$

Tire:	Speed Condition	20 MPH		0 MPH	
		Peak	Slide	Peak	Slide
RA					
RE		.70	.65	.75	.66
XB		.88	.85	.96	.89
XC		.85	.80	1.06	1.05
SXD		.83	.84	1.00	.89

Test No. 3 DecelerationSurface: Dry Asphalt $\mu = .73$

Tire:	Speed Condition	20 MPH		45 MPH	
		Peak	Slide	Peak	Slide
RA		1.00			
RE		.96	1.03	.96	.97
XB		.97	1.04	1.03	1.02
XC		.93	.97	1.00	.91
SXD		.92	1.04	.94	1.02

Differences of $\pm .05$ are possibly insignificant.Test No. 4 DecelerationSurface: Wet Asphalt $\mu = .46$

Tire:	Speed Condition	20 MPH		40 MPH		50 MPH	
		Peak	Slide	Peak	Slide	Peak	Slide
RA		1.00					
RF		1.05	1.12	.95	.98	.99	.94
RD		.91	1.04	.95	.99	.98	.99
RH		1.02	1.04	.99	.95	1.05	1.06
XB		.94	.97	1.0	1.21	1.11	1.11
XI		.89	.99	.89	1.03	.87	1.04
LJ		.95	.99	1.00	.98	1.07	1.10
XX		.92	.92	.99	1.12	.97	1.15

Test No. 5 Tractive Effort - DrawbarSurface: Wet Polished Concrete $\mu = .10$

Tire	Max.	Hi-Slip
RA	1.00	1.00
RE	.81	.70
XB	.95	.95
EO	1.02	1.01
SXD	.88	.94

The above tests are on hard surfaces. On soft surfaces, e.g. mud, testing is more difficult. Cross bar and special service tires are also designed for added traction in the softer surfaces.

Noise Testing

Surface: Worn Concrete - Highway

Instrumentation: B&K, Precision SLM. Microphone horizontal. SAE arrangement.

Vehicle & Tires: 10,00-20 12 PR nylon bias tires - new.

Load: 4550# tire Inflation (cold): 75 PSI

10,00-20 HGR - Front. Speed: 50 MPH

Coast-By. the db(A) values are from tests run by different companies, with different vehicles and road surfaces.

<u>Tire</u>	<u>Spectra</u>	<u>db(A) 50 ft.</u>	
RAA	1	73.9	(Minimum tire)
XB	2	79.2	
IC	3	76.1	
SXD	4	78	

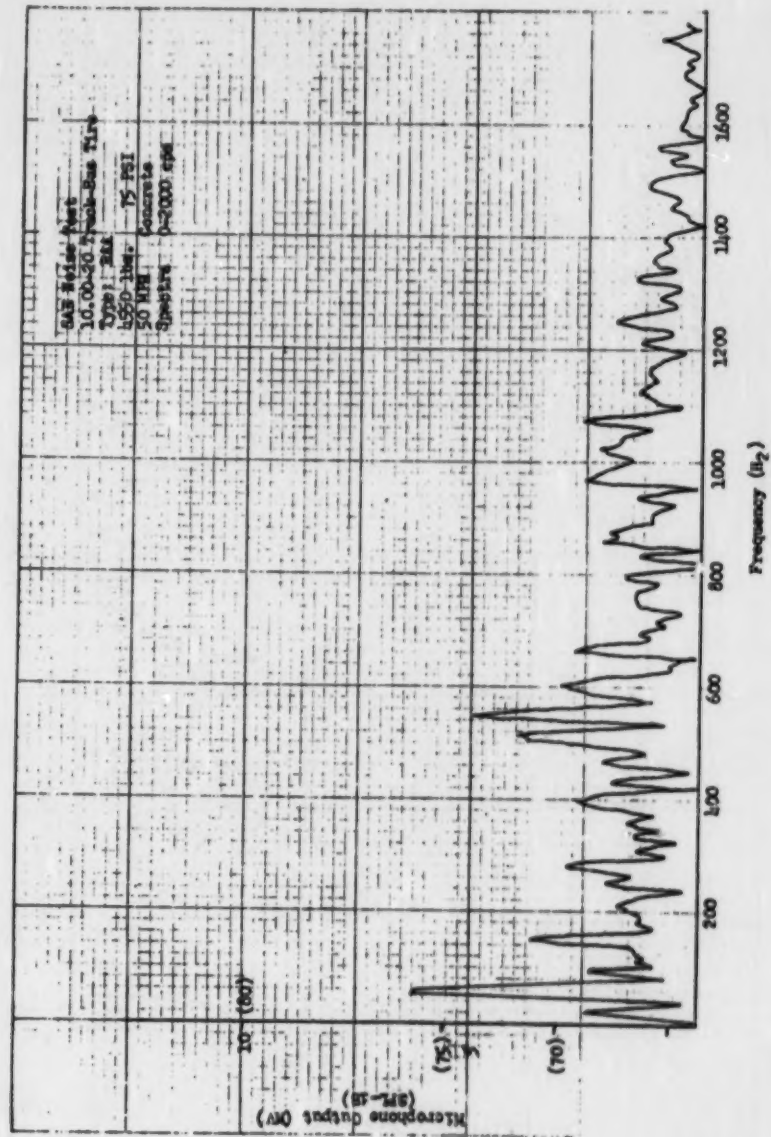
Spectra graphs were made on a chart recorder using: A Federal Scientific "Ubiquitous" Model UA-10 real time analyser. The sweep was 0 to 2000 cps, which gave a 10 cps band width and a -3db drop at band width. The scale is 100 db equals 100 millivolts (90 db = 31.6 mv) and the calibration signal was 94 db @ 1000 cps.

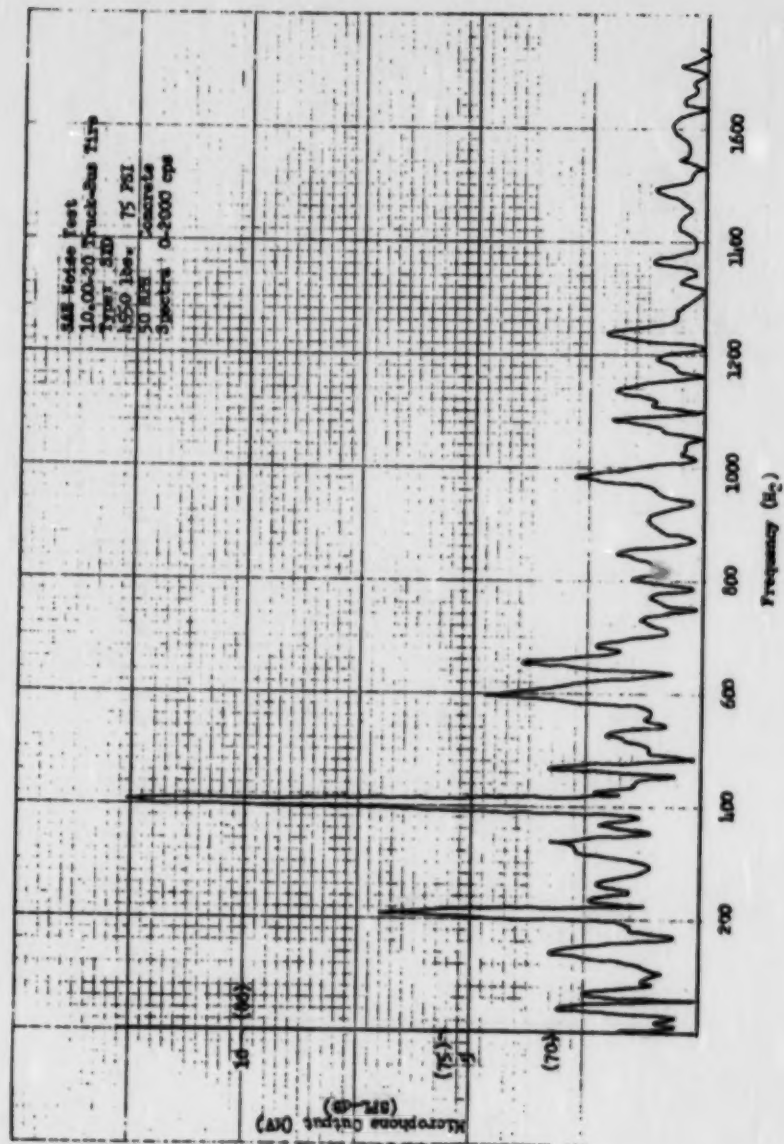
Comments on Spectra and db(A):

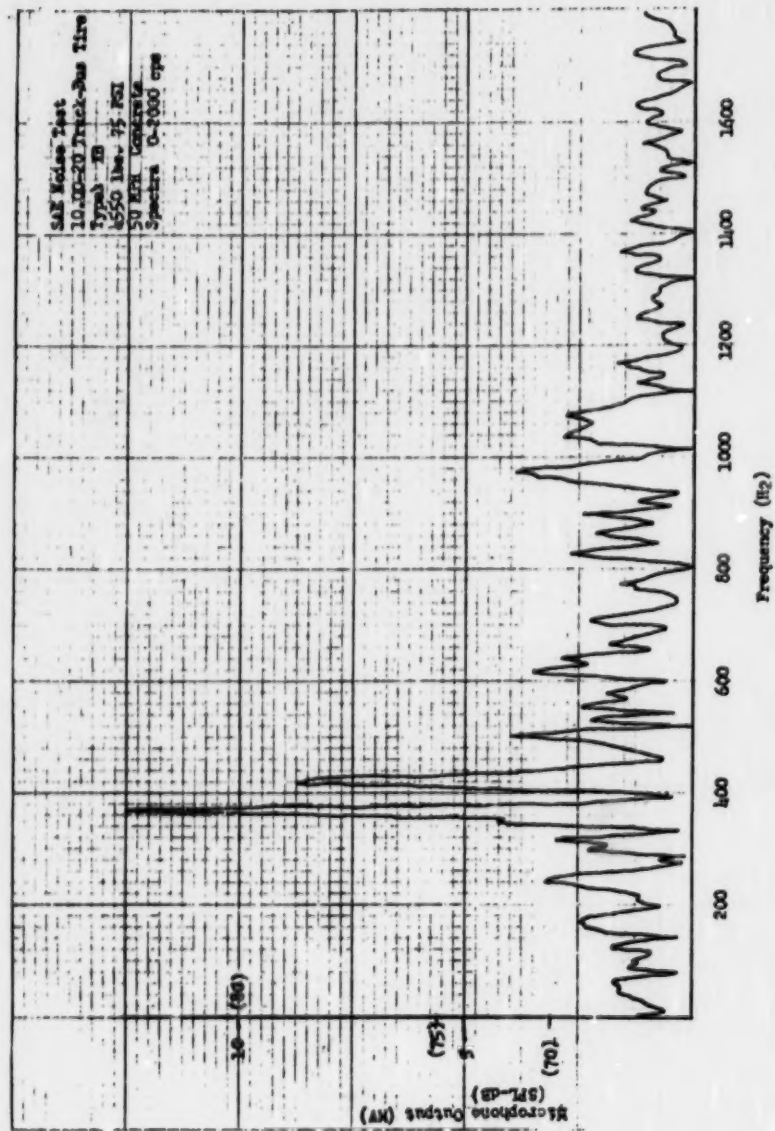
1. Tires with annoying tonal concentrations may be weighted equal to tires with "white" spectra that are not annoying by using db(A), with no spectral reference.
2. Indoor and outdoor tests do show that there are differences in the tonal content of different types of tires. These differences are in sound level and tonal content. Present indoor and outdoor testing may not correlate in a manner such that one can be used to predict the other. However, both indicate the range of combinations of tone locations and levels for different tires.
3. The primary concern is to reduce the annoyance and overall level of the noise. The overall level db(A) may be reduced but the tones may still cause annoyance.

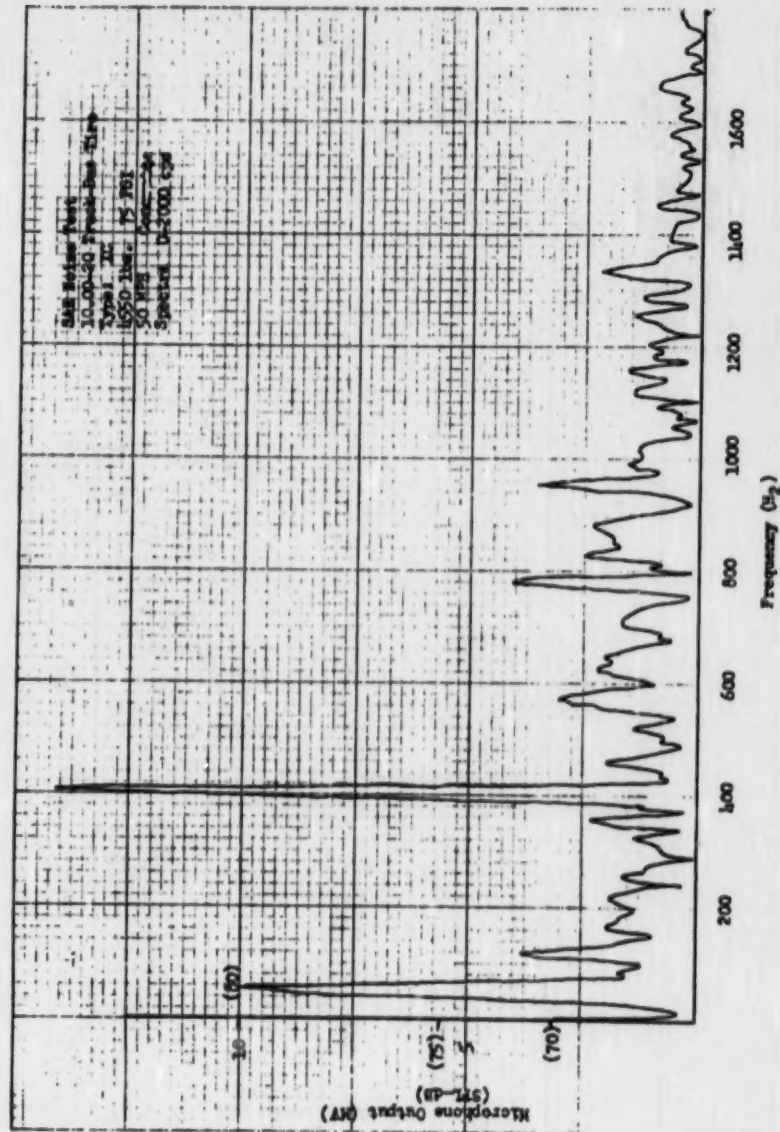
Comments on measuring tire noise for certification:

1. In any test a standard "quiet" tire is needed.
2. For outdoor testing a standard vehicle, road surface, and set of ambient conditions is required.
3. There are additional questions relative to environmental road surface conditions. How much does the db(A) and spectra change for wet surfaces? The quieter tire on dry pavement may be more annoying when the pavement is wet.









NOISE DATA FOR RMA PRESENTATION TO EPA1. Sound level at various distances

In a free field SPL is halved for each doubling of distance from the source. This may be written mathematically as

$$\Delta \text{SPL} = 20 \log \frac{d_2}{d_1} \quad | \quad d_2 > d_1.$$

Experiments conducted over concrete, asphalt and bare earth have shown that slightly greater attenuation exists for roadside measurements. A more correct formula is

$$\Delta \text{SPL (dBA)} = K \log \frac{d_2}{d_1}$$

where K varies from 23 to 25 depending on the surface.

2. Sound level vs. speed.

See Table I.

3. Sound level vs. load at constant inflation.

has no data.

4. Sound level vs. load at constant deflection.

has no data.

5. Effect of road surfaces.

Major differences have been observed but no data are available. All tests were conducted on smooth, semi-polished concrete.

6. Effect of wear.

Sound pressure level invariably is higher with worn than with new tires. For the cross bar tires measured the increase of worn over new averaged 6 dB(A) with a range of 4.2 to 8.7. Rib type tires had an increase of 1.1 dB(A) with a range of 0.2 to 3.5.

7. Spectral characteristics of peak tire sounds.

One third octave spectrum analysis for a typical noise treated cross bar tire and for a non-noise treated cross bar tire are given in the accompanying Figure 1.

8. Fast vs. slow spectral response.

has used slow response in its tire testing. The correlation of slow response with jury rating has been found to be slightly greater than is true for fast. In addition, the operator error is significantly lower.

9. Data arguing for spectral considerations in evaluation.

Figure 1 gives the 1/3 octave analysis of the peak sound level of two tire types. The peak SPL for the T344 is 79.5 dB(A) and is 80 dB(A) for the T411. The T411 is a modern noise treated tire while the T344 is an old design without noise treatment. The T344 produces the typical truck tire "whine" long after the truck has passed and is considered to be an annoying tire. Figure 2 is the spectral analysis of the two tires 4 seconds after peak. Although there is little in Figure 1 to indicate the reason for the difference in the persistence of sound between the two tires it is strongly indicated in Figure 2 that the high frequency (1000-2000 Hz) components are responsible. Additional data are required to establish that "whining" tires are always caused by the high frequency part of the spectrum. The best method of testing for this feature is also to be established.

10. Range of spectral distribution over different types of tires.

We have no hard data; however, it is known that almost all of the tire noise is contained in the range 200-2000 Hz.

11. Lowest possible noise level obtainable under today's conditions.

The lowest noise level we have obtained under standard test conditions is 72.3 dB(A) using smooth treads on all wheels. With plain treads on the front and rib treads on the dual wheel drive axle 74-75 dB(A) can be obtained. With plain treaded tires on the front axle and cross bar tires on the drive axle 77-80 dB(A) for new tires and 83-85 dB(A) for worn tires is obtained.

12. Additivity of tire noises.

has no data.

13. Performance differentials between cross rib and circumferential tires.

<u>Relative Mileage</u>			
<u>Test No.</u>	<u>Type</u>	<u>Removal Mileage</u>	<u>Rating *</u>
1	Rib	40,000	100
	Cross bar	40,000	181
2	Rib	32,000	100
	Cross bar	32,000	183

* Based on estimated non-skid miles at removal.

<u>Relative Traction*</u>		
<u>Starting Traction</u>	<u>Peak</u>	<u>Spin</u>
Rib	100	100
Cross bar	104	124
<u>Pull Down Traction</u>		
Rib	100	100
Cross bar	100	119

* Constant speed - approximately 5 mph on smooth, wet concrete.

14. Effect of tire size.

A direct comparison of 10.00-20 and 10.00-22 showed the larger tire to produce a 2 dB(A) lower SPL for the same load. Table I.

15. Tubeless vs. tube type.

No difference has been observed between tube vs. tubeless tires. Table I.

16. Radial vs. conventional.

No difference has been observed between radial and conventional tires.

TABLE I

PRESSURE VARIATIONdB(A) RATING

<u>INFLATION</u>	<u>NEW</u>	<u>T110</u>	<u>WORN</u>	<u>NEW</u>	<u>T200</u>	<u>WORN</u>
50 PSI	74.1		75.0	80.5		85.0
60 PSI	74.7		75.2	80.0		83.5
70 PSI	75.0		76.5	79.3		83.5

SPEED VARIATIONdB(A) RATING

<u>SPEED</u>	<u>NEW</u>	<u>T110</u>	<u>WORN</u>	<u>NEW</u>	<u>T200</u>	<u>WORN</u>
30 MPH	68.5		70.7	73.5		75.0
40 MPH	72.0		73.0	74.9		79.8
50 MPH	75.0		76.5	79.3		83.5

TUBED VS TUBELESS

<u>SIZE</u>	<u>TYPE</u>	<u>dB(A) NEW</u>
10.00-20	T200	79.3
11-22.5	T200	78.5

SIZE VARIATION

<u>SIZE</u>	<u>TYPE</u>	<u>dB(A) NEW</u>
10.00-20	T200	79.3
10.00-22	T200	77.1

Figure 1. ONE-THIRD OCTAVE ANALYSIS - PEAK

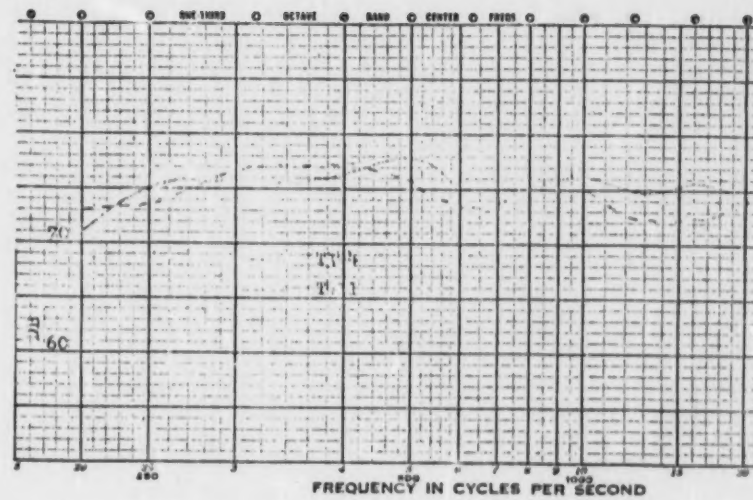
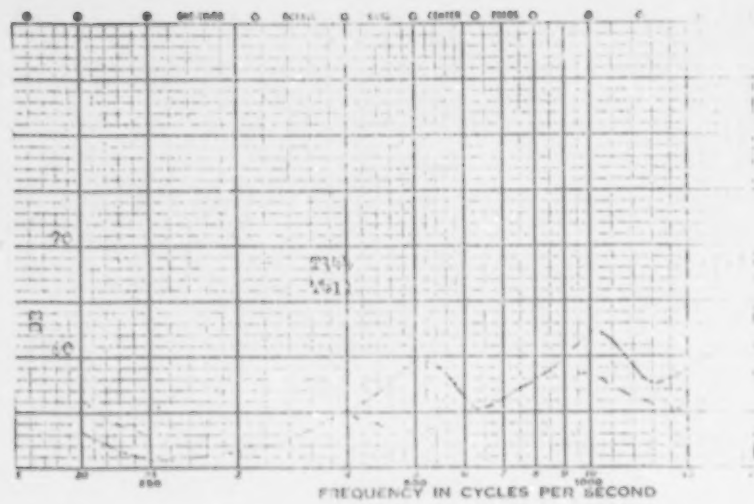


Figure 2. CUG-THIN - OCTAVE ANALYSIS
 10/11/54 1300

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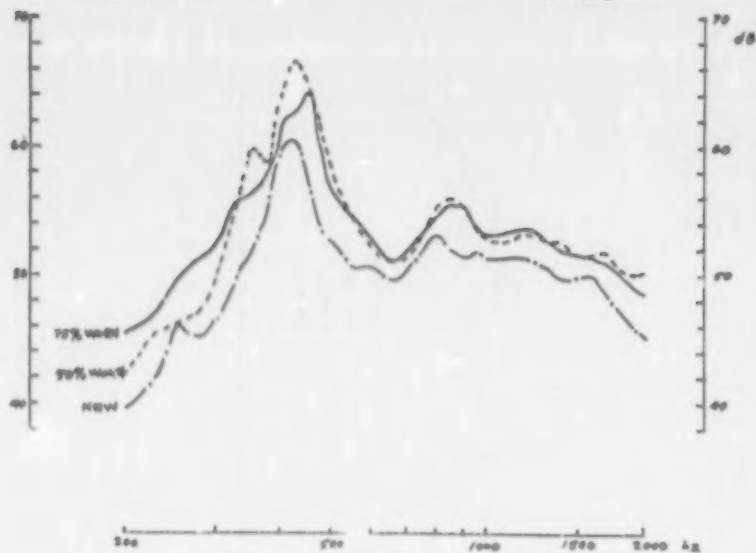


421

25 PSI
4760 lbs
1/2 OCTAVE ANALY.

50 MPH

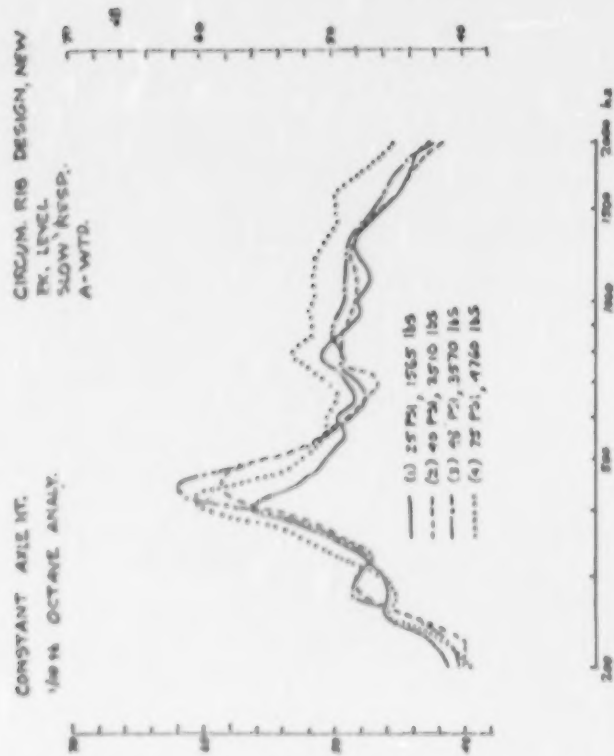
CIRCUM. RIS DESIGN
PK LEVEL
SLOW RESP
A-WTD.



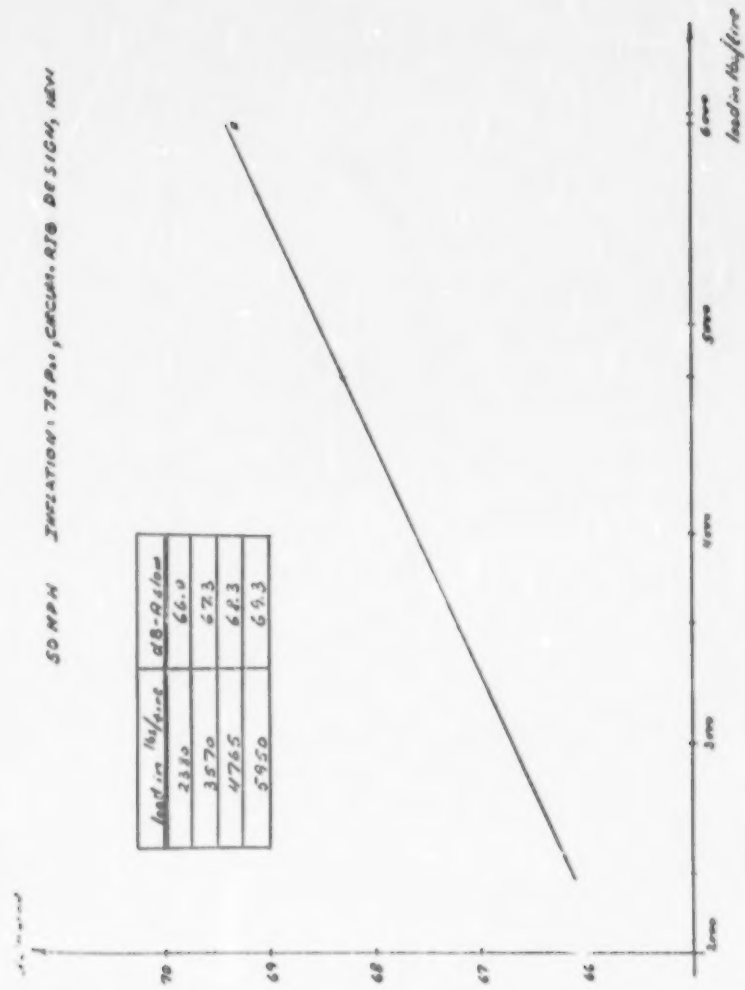
CONSTANT INTENSITY: 75 DB
 1/2 IN OCTAVE ANALY.
 Spd: d: 50 MPH

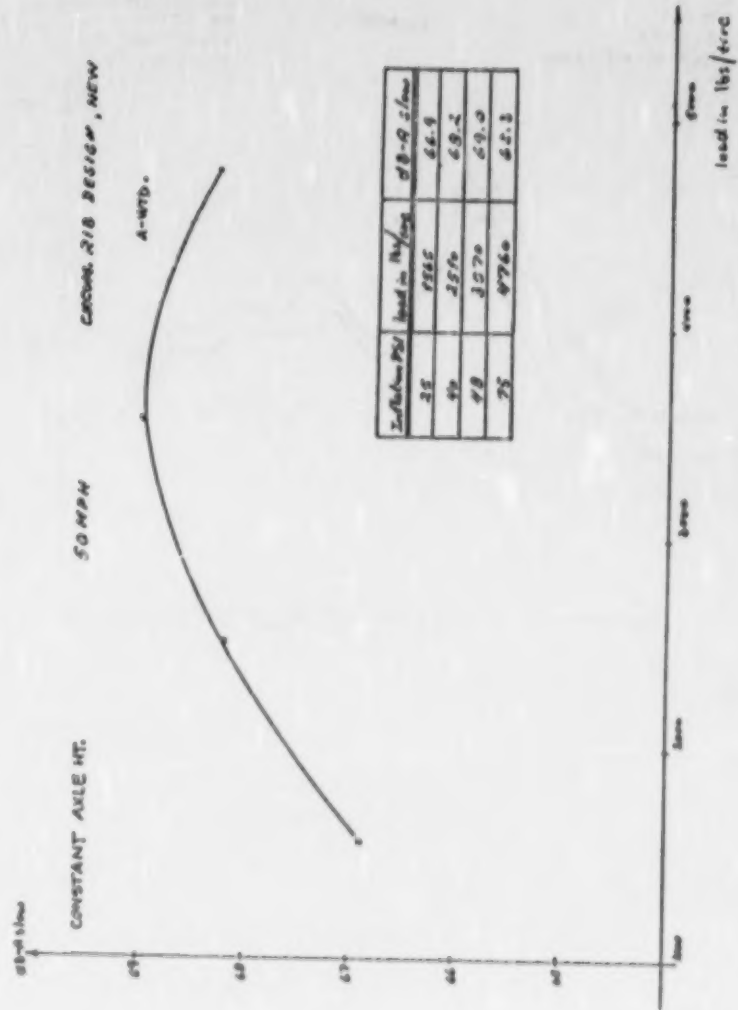
CIRCUM. AIB DESIGN, NEW
 AIR LEVEL
 SLOW RESPONSE
 B-WTD.





50 MPH TWEETATION: 75 Pa., CIRCULAR DESIGN, NEW



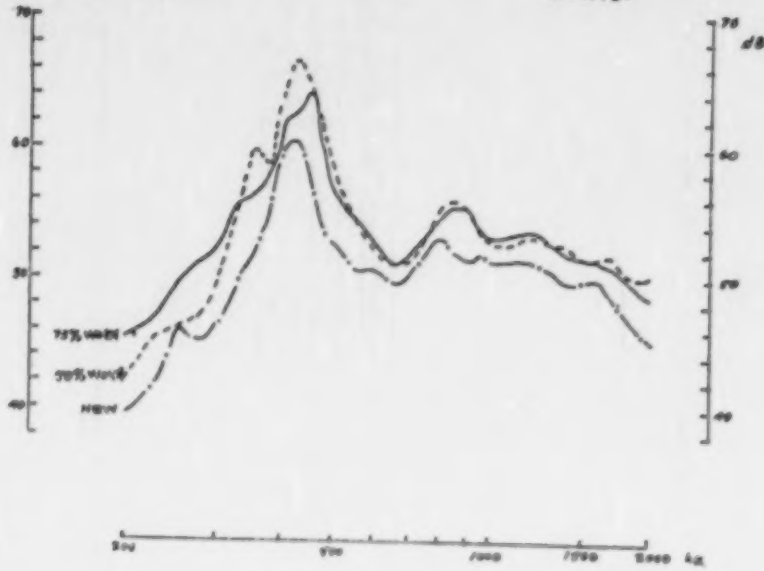


426

75 PSI
9760 lbs
1/10th OCTAVE ANALY.

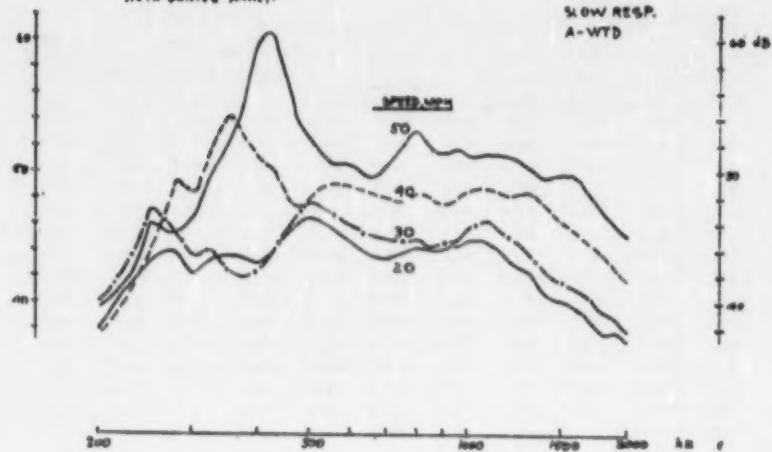
50 MPH

CIRCUM. RIB DESIGN
PK LEVEL
SLOW RESR
A-WTD.



75 PSI
4760 RUS
1/2 Octave ANALY.

CIRCUM. RIB DESIGN
PK LEVEL
SLOW RESP.
A-WTD



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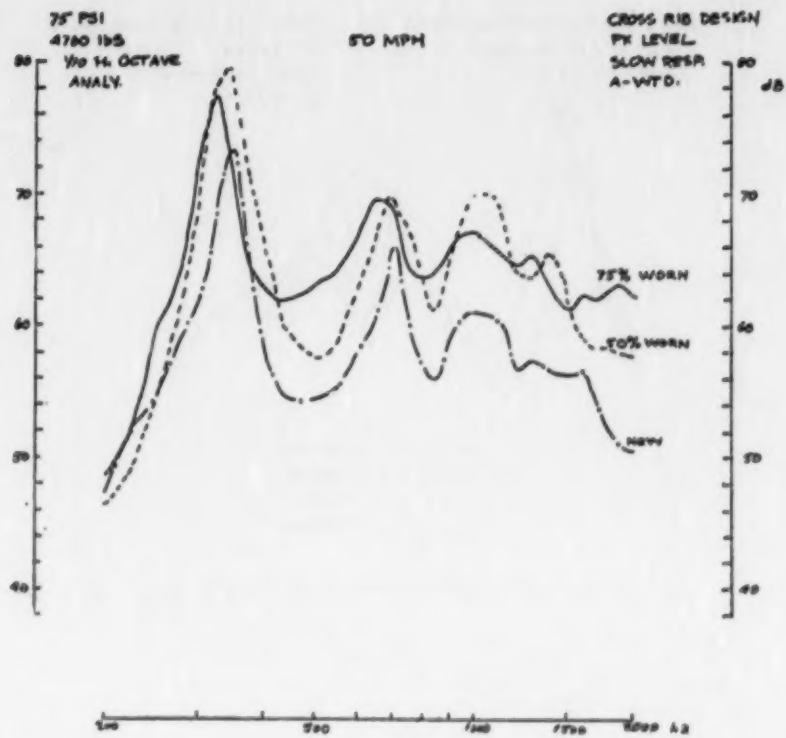
428

EFFECT OF SPEED AT TURN COND.
EFFECT OF LOAD AT DOWN, TSP31

TRAIL 4760
TRAIL 75131

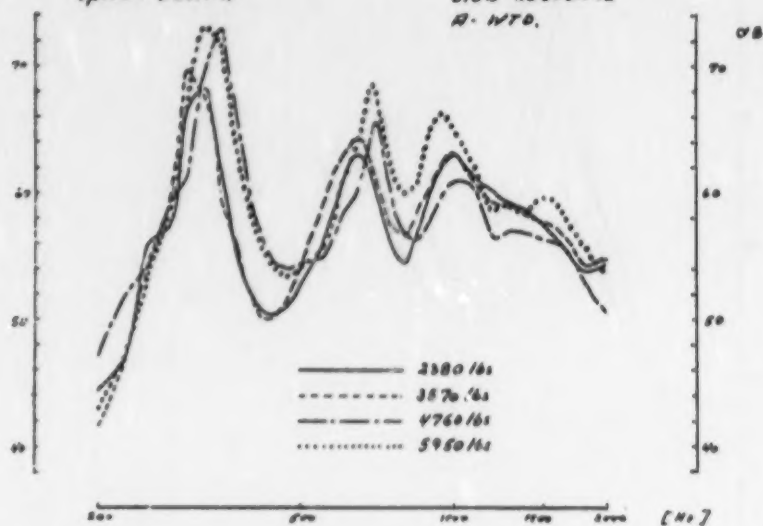
NOTE: DET. ANALYSIS, A-WTD., BLOWRSP., PK LEVEL.

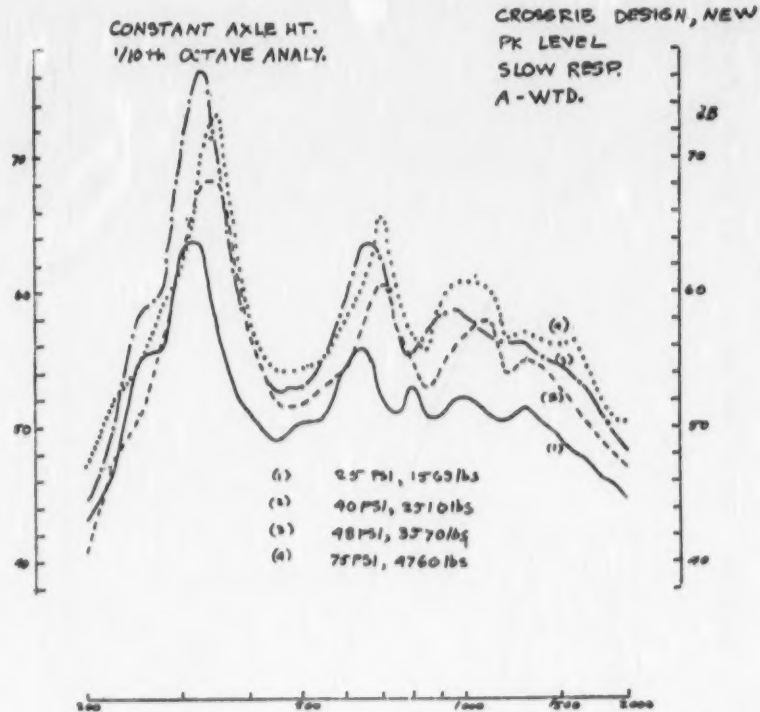
Speed mph	OX Moss (Group 0)								Dry 8		Dry 10		Dry 12		Dry 14		Dry 16		Dry 18		Dry 20		Dry 22		Dry 24		Dry 26		Dry 28		Dry 30		Dry 32		Dry 34		Dry 36		Dry 38		Dry 40		Dry 42		Dry 44		Dry 46		Dry 48		Dry 50		Dry 52		Dry 54		Dry 56		Dry 58		Dry 60		Dry 62		Dry 64		Dry 66		Dry 68		Dry 70		Dry 72		Dry 74		Dry 76		Dry 78		Dry 80		Dry 82		Dry 84		Dry 86		Dry 88		Dry 90		Dry 92		Dry 94		Dry 96		Dry 98		Dry 100		Dry 102		Dry 104		Dry 106		Dry 108		Dry 110		Dry 112		Dry 114		Dry 116		Dry 118		Dry 120		Dry 122		Dry 124		Dry 126		Dry 128		Dry 130		Dry 132		Dry 134		Dry 136		Dry 138		Dry 140		Dry 142		Dry 144		Dry 146		Dry 148		Dry 150		Dry 152		Dry 154		Dry 156		Dry 158		Dry 160		Dry 162		Dry 164		Dry 166		Dry 168		Dry 170		Dry 172		Dry 174		Dry 176		Dry 178		Dry 180		Dry 182		Dry 184		Dry 186		Dry 188		Dry 190		Dry 192		Dry 194		Dry 196		Dry 198		Dry 200		Dry 202		Dry 204		Dry 206		Dry 208		Dry 210		Dry 212		Dry 214		Dry 216		Dry 218		Dry 220		Dry 222		Dry 224		Dry 226		Dry 228		Dry 230		Dry 232		Dry 234		Dry 236		Dry 238		Dry 240		Dry 242		Dry 244		Dry 246		Dry 248		Dry 250		Dry 252		Dry 254		Dry 256		Dry 258		Dry 260		Dry 262		Dry 264		Dry 266		Dry 268		Dry 270		Dry 272		Dry 274		Dry 276		Dry 278		Dry 280		Dry 282		Dry 284		Dry 286		Dry 288		Dry 290		Dry 292		Dry 294		Dry 296		Dry 298		Dry 300		Dry 302		Dry 304		Dry 306		Dry 308		Dry 310		Dry 312		Dry 314		Dry 316		Dry 318		Dry 320		Dry 322		Dry 324		Dry 326		Dry 328		Dry 330		Dry 332		Dry 334		Dry 336		Dry 338		Dry 340		Dry 342		Dry 344		Dry 346		Dry 348		Dry 350		Dry 352		Dry 354		Dry 356		Dry 358		Dry 360		Dry 362		Dry 364		Dry 366		Dry 368		Dry 370		Dry 372		Dry 374		Dry 376		Dry 378		Dry 380		Dry 382		Dry 384		Dry 386		Dry 388		Dry 390		Dry 392		Dry 394		Dry 396		Dry 398		Dry 400		Dry 402		Dry 404		Dry 406		Dry 408		Dry 410		Dry 412		Dry 414		Dry 416		Dry 418		Dry 420		Dry 422		Dry 424		Dry 426		Dry 428		Dry 430		Dry 432		Dry 434		Dry 436		Dry 438		Dry 440		Dry 442		Dry 444		Dry 446		Dry 448		Dry 450		Dry 452		Dry 454		Dry 456		Dry 458		Dry 460		Dry 462		Dry 464		Dry 466		Dry 468		Dry 470		Dry 472		Dry 474		Dry 476		Dry 478		Dry 480		Dry 482		Dry 484		Dry 486		Dry 488		Dry 490		Dry 492		Dry 494		Dry 496		Dry 498		Dry 500		Dry 502		Dry 504		Dry 506		Dry 508		Dry 510		Dry 512		Dry 514		Dry 516		Dry 518		Dry 520		Dry 522		Dry 524		Dry 526		Dry 528		Dry 530		Dry 532		Dry 534		Dry 536		Dry 538		Dry 540		Dry 542		Dry 544		Dry 546		Dry 548		Dry 550		Dry 552		Dry 554		Dry 556		Dry 558		Dry 560		Dry 562		Dry 564		Dry 566		Dry 568		Dry 570		Dry 572		Dry 574		Dry 576		Dry 578		Dry 580		Dry 582		Dry 584		Dry 586		Dry 588		Dry 590		Dry 592		Dry 594		Dry 596		Dry 598		Dry 600		Dry 602		Dry 604		Dry 606		Dry 608		Dry 610		Dry 612		Dry 614		Dry 616		Dry 618		Dry 620		Dry 622		Dry 624		Dry 626		Dry 628		Dry 630		Dry 632		Dry 634		Dry 636		Dry 638		Dry 640		Dry 642		Dry 644		Dry 646		Dry 648		Dry 650		Dry 652		Dry 654		Dry 656		Dry 658		Dry 660		Dry 662		Dry 664		Dry 666		Dry 668		Dry 670		Dry 672		Dry 674		Dry 676		Dry 678		Dry 680		Dry 682		Dry 684		Dry 686		Dry 688		Dry 690		Dry 692		Dry 694		Dry 696		Dry 698		Dry 700		Dry 702		Dry 704		Dry 706		Dry 708		Dry 710		Dry 712		Dry 714		Dry 716		Dry 718		Dry 720		Dry 722		Dry 724		Dry 726		Dry 728		Dry 730		Dry 732		Dry 734		Dry 736		Dry 738		Dry 740		Dry 742		Dry 744		Dry 746		Dry 748		Dry 750		Dry 752		Dry 754		Dry 756		Dry 758		Dry 760		Dry 762		Dry 764		Dry 766		Dry 768		Dry 770		Dry 772		Dry 774		Dry 776		Dry 778		Dry 780		Dry 782		Dry 784		Dry 786		Dry 788		Dry 790		Dry 792		Dry 794		Dry 796		Dry 798		Dry 800		Dry 802		Dry 804		Dry 806		Dry 808		Dry 810		Dry 812		Dry 814		Dry 816		Dry 818		Dry 820		Dry 822		Dry 824		Dry 826		Dry 828		Dry 830		Dry 832		Dry 834		Dry 836		Dry 838		Dry 840		Dry 842		Dry 844		Dry 846		Dry 848		Dry 850		Dry 852		Dry 854		Dry 856		Dry 858		Dry 860		Dry 862		Dry 864		Dry 866		Dry 868		Dry 870		Dry 872		Dry 874		Dry 876		Dry 878		Dry 880		Dry 882		Dry 884		Dry 886		Dry 888		Dry 890		Dry 892		Dry 894		Dry 896		Dry 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1708		Dry 1710		Dry 1712		Dry 1714		Dry 1716		Dry 1718		Dry 1720		Dry 1722		Dry 1724		Dry 1726		Dry 1728		Dry 1730		Dry 1732		Dry 1734		Dry 1736		Dry 1738		Dry 1740		Dry 1742		Dry 1744		Dry 1746		Dry 1748		Dry 1750		Dry 1752		Dry 1754		Dry 1756		Dry 1758		Dry 1760		Dry 1762		Dry 1764		Dry 1766		Dry 1768		Dry 1770		Dry 1772		Dry 1774		Dry 1776		Dry 1778		Dry 1780		Dry 1782		Dry 1784		Dry 1786		Dry 1788		Dry 1790		Dry 1792		Dry 1794		Dry 1796		Dry 1798		Dry 1800		Dry 1802		Dry 1804		Dry 1806		Dry 1808		Dry 1810		Dry 1812		Dry 1814		Dry 1816		Dry 1818		Dry 1820		Dry 1822		Dry 1824		Dry 1826		Dry 1828		Dry 1830		Dry 1832		Dry 1834		Dry 1836		Dry 1838		Dry 1840		Dry 1842		Dry 1844		Dry 1846		Dry 1848	
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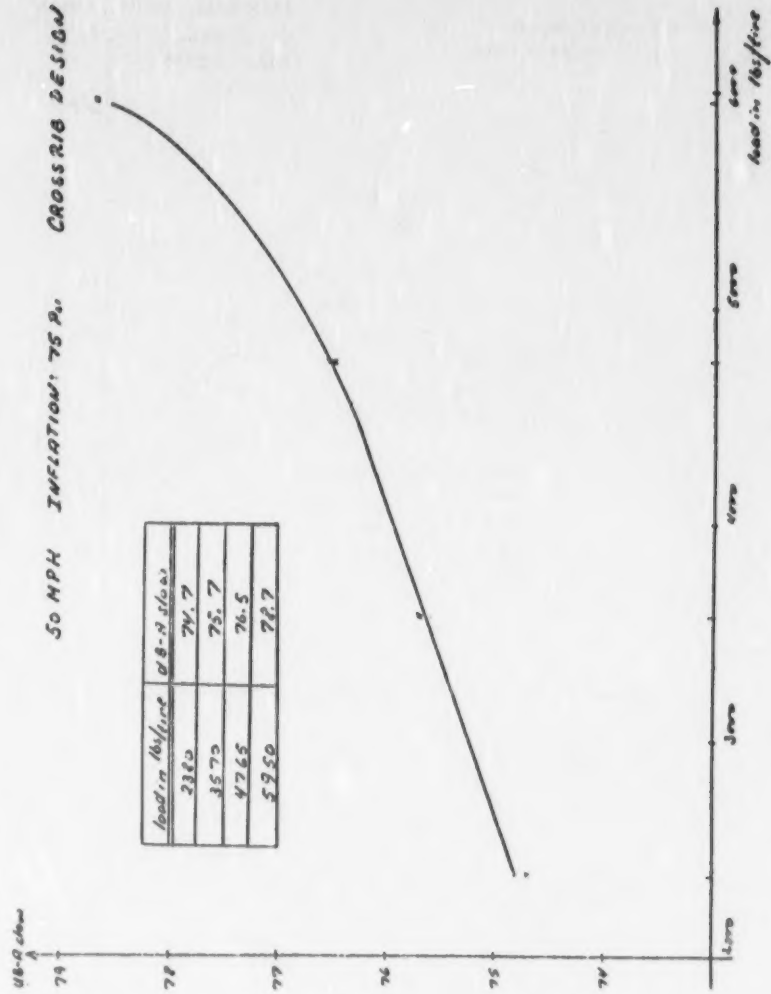
CONSTANT INFLECTION: 75 PSI
 % IN OCTAVE ANGLE
 SPEED: 50 MPH

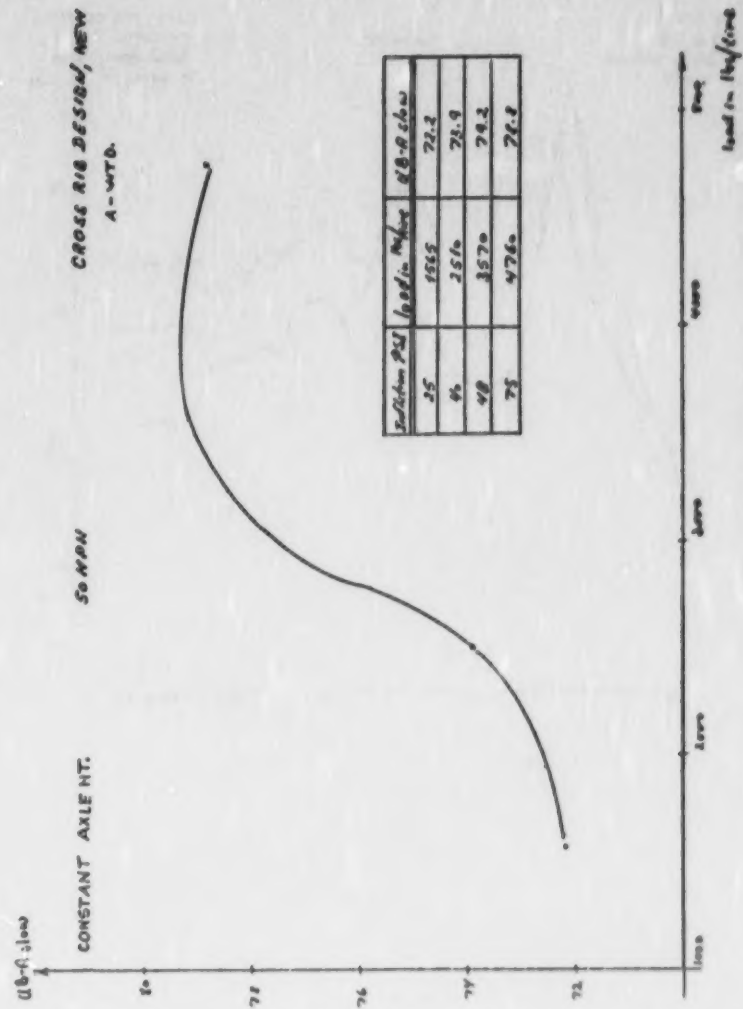
CROSS RIB DESIGN, NEW
 PK LEVEL
 SLOW RESPONSE
 R-INTD.

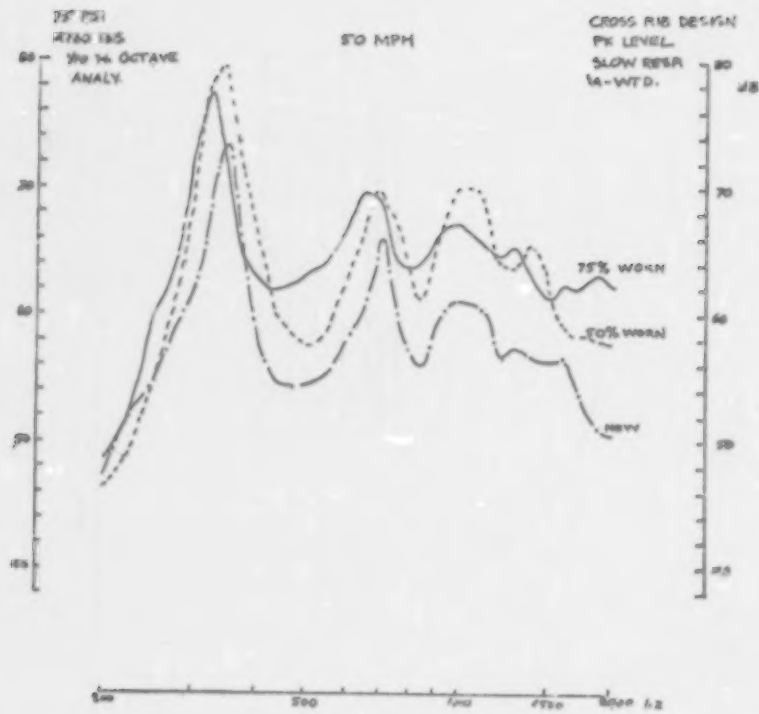


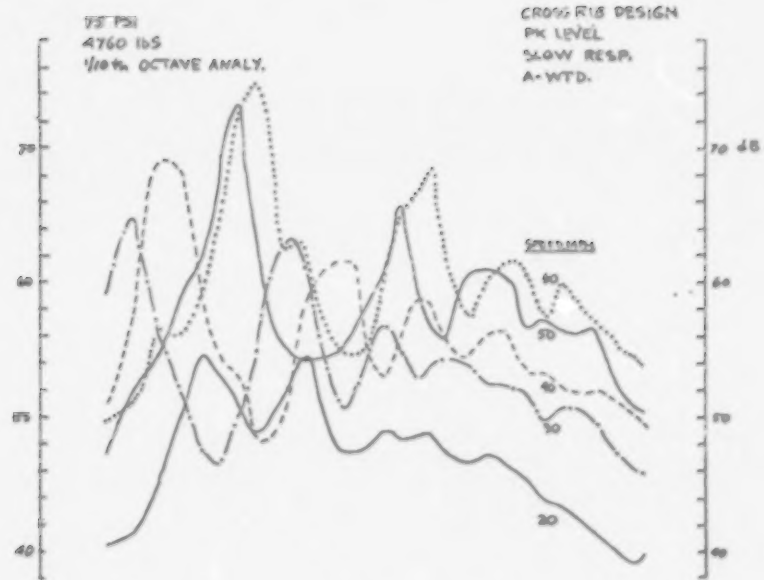


50 MPH INFILTRATION: 75 P. CROSSRIB DESIGN









EFFECT OF LOAD AT 20 MPH

92

at 20 mph

Load City Cnd	25 psi 4000/10	40 psi 4000/10	45 psi 4000/10	75 psi 4000/10
200 Hc	42.1	46.9	49.5	47.1
220 Hc	43.2	47.8	50.1	48.1
240 Hc	44.7	48.8	51.5	49.2
250 Hc	45.9	49.1	51.1	50.0
260 Hc	46.1	49.9	50.5	50.8
275 Hc	46.6	50.1	50.1	50.1
280 Hc	47.4	50.1	49.9	50.4
275 Hc	48.1	50.4	49.4	50.2
400 Hc	48.5	50.2	49.2	50.0
425 Hc	48.9	50.1	48.9	50.4
450 Hc	49.1	50.9	48.7	50.4
475 Hc	49.7	51.7	49.9	50.1
500 Hc	50.0	51.9	50.9	50.0
550 Hc	50.7	51.1	50.1	50.0
600 Hc	50.2	50.5	49.9	50.0
650 Hc	50.9	50.5	49.9	50.1
700 Hc	51.1	50.5	49.9	50.7
750 Hc	51.2	50.9	49.1	50.0
800 Hc	51.2	50.0	49.2	50.9
850 Hc	50.9	50.1	49.7	50.9
900 Hc	50.9	50.0	49.9	50.1
950 Hc	50.5	50.9	49.6	50.7
1000 Hc	50.1	50.9	49.3	50.9
1100 Hc	50.1	50.1	49.5	50.5
1200 Hc	50.7	50.1	49.0	50.7
1300 Hc	51.5	50.0	49.1	50.1
1400 Hc	50.1	50.9	49.9	50.5
1500 Hc	50.5	51.0	49.1	50.1
1600 Hc	50.1	51.7	49.9	50.5
1700 Hc	49.1	50.1	49.9	50.9
1800 Hc	49.2	49.0	49.9	50.1
1900 Hc	49.9	49.2	49.1	50.7
2000 Hc	49.1	49.1	49.0	50.1
Total Hc	51.1	50.9	49.2	50.2

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AFTERNOON SESSION

Dr. MEYER. It's 1 o'clock. We will reconvene this hearing by setting some sort of a record, starting the hearing promptly at the reconvening time.

At this time I'd like to ask Mrs. Ann Sutton of Burgundy Hill Farm School, Alexandria, Va., if she would like to make a statement. I see you are accompanied by some of your students. It's nice to have you with us.

STATEMENT OF MRS. ANN SUTTON, BURGUNDY FARM
COUNTRY DAY SCHOOL, ALEXANDRIA, VA.

Mrs. SUTTON. That's right. The name of the school is Burgundy Farm Country Day School. The "Hill" doesn't belong there, although the school is on a hill, right next to Route 495 Beltway in Alexandria.

Our students have been studying sound and noise as a unit of study this fall, and this was one reason I wanted some of them to come and hear some of the technical testimony, which they found very difficult to follow.

They have given me their suggestions for noise abatement, and it occurred to me that you might like to inject into your more technical discussion—not exactly something from the lighter side, but from the younger part of our population.

Dr. JOHNSON. What grades are they in?

Mrs. SUTTON. These students are in the sixth, seventh, and eighth, those who are going to form the voting population in the future. So these are some of their ideas about how noise could be made less in our country.

They urge the passage of antinoise codes throughout the country that would make cities quieter places in which to live, by such means as semiannual noise inspections for all vehicles, particularly to meet standards set the mufflers, and by strict enforcement of a night curfew at National Airport, which is now largely a travesty.

If Chicago finds it possible to set up an antinoise code that they can effectively carry out, then we feel that that could be done here too.

We also urge the passage of laws aimed at stopping noise at its source by such means as retrofitting jet airplanes for noise abatement, and—if there is such a thing—setting up a quiet horn system for motor vehicles. And particularly by persuading

industries to produce quiet home appliances, such as vacuum cleaners, disposals, and blenders.

Many of our students come from inner city, and they are particularly concerned that the Metro stations now being constructed be made as acoustically quiet as possible, and that the vehicles in the Metro system be equipped with rubber tires, as they are in cities that have quiet metro systems.

One student had the novel suggestion that telephones be entirely stopped from ringing, or at least fitted with a pleasant chime or a light system, instead of a loud ringing bell. Other students suggested sound insulation requirements for all buildings, both public and private, in the future, written into the building codes.

The use of pneumatic drills and jackhammers, it was felt by many students, should either cease or quiet ones be invented to replace those now in use.

It was suggested that workmen whose jobs require constant exposure to loud noise levels should be required to wear some kind of earplugs when noise around them reaches a specified decibel level, until the noise in the working places can be reduced or eliminated.

It's also been suggested that EPA might sponsor a yearly national antinoise week or day each year, in order to focus attention on reducing noise levels.

Another thing that we would like to urge is a vigorous campaign of educating the public in the United States to the fact that noise is damaging both physically and psychologically, and that most of it is entirely unnecessary and is controllable.

At our particular school, a great emphasis is placed on natural history and nature study. We have a 23-acre tract of wooded land, and our school has been in existence of 25 years. Each year the noise level has become more deafening. We have tried to carry on over the years, for example, a bird survey in the spring each year as the birds are migrating through in May, and over the years, the upper grades, as part of their study, have found that it is almost impossible now to conduct that study, because of the noises of the low-flying helicopters, planes from National Airport, which fly very low over our school, trucks from the beltway, train whistles, and the fact that on our grounds, every other Wednesday morning, there is the sound of a large air-raid alarm system for a few minutes at 11 o'clock every Wednesday morning.

It seems to me this sound particularly might be put at another time of day besides when the school is in operation.

We would like to thank you for this opportunity to come before your Agency and have the suggestions of the younger set heard. Thank you.

Dr. MEYER. Mrs. Sutton, thank you very much for being a spokesman for your pupils and their study. I am sure you would not object to perhaps answering a question or two from members of the panel who might be so inclined.

Mrs. SUTTON. Not at all.

Dr. MEYER. Dr. Dietrich, do you have any questions?

Dr. DIETRICH. No.

Dr. MEYER. Dr. Johnson?

Dr. JOHNSON. I'd like to ask what type of curfew hours they might recommend—they have probably thought of this.

Mrs. SUTTON. Well, either from 10 to 7, or from 11 to 7. But that it be enforced more than it is at present. At present it is a so-called gentlemen's agreement, and there must be a lot of people who aren't really gentlemen.

Dr. JOHNSON. And I was wondering if they had thought about regulating the type of traffic that you have at various times of day. In other words, you have varied curfews throughout the day such as no trucks allowed in certain districts, during certain hours of the day. And so you could vary it, for example, delivery trucks at certain times of the day.

Mrs. SUTTON. Yes, that would help.

Mr. ELDRED. Have you had an opportunity to measure the noise on the 23 acres?

Mrs. SUTTON. No; we would like to have access to a decibel meter. We find they are hard to come by. People don't like to lend them out, and I guess they are pretty expensive.

Mr. BERLAND. Let me offer you the use of our noise meter. It's a portable type. It's on loan to us from the manufacturer, and I am sure I can extend that to you.

Mrs. SUTTON. Thank you.

Dr. MEYER. That sounds like a very nice gesture.

Mr. BERLAND. I think that you have a most comprehensive antinoise program, and I compliment you in your quest.

I was particularly interested, among other things, about the fact that, the very nature of the fact that you have included quiet or antinoise education in your studies. And I wonder if you, as a teacher, have any knowledge if this is being done as a formal part in any curriculum, either in this area or perhaps generally.

Mrs. SUTTON. No, I don't. Actually, I became interested in it through taking a course in environmental education at George Washington University last summer, in their environmental ecology program, and I introduced the unit of study after taking that course.

Dr. JOHNSON. How much is the unit?

Mrs. SUTTON. This was a 6-hour credit course at George Washington University.

Dr. JOHNSON. But I wondered about the unit of study for the children.

Mrs. SUTTON. The students have been doing the study since school started in September, and have just about finished now. And this makes a nice conclusion to their study, their being able to present their conclusions to you.

Dr. JOHNSON. Then a whole term was spent on acoustics?

Mrs. SUTTON. Yes. And they did experiments of various kinds, used tape recorders to tape different places around our campus, trying to find quiet versus noisy places. They taped the lunchroom, for example, which was pretty noisy at times.

Dr. JOHNSON. Would you like to see other schools have this, based on your experience?

Mrs. SUTTON. I think it would be helpful to other schools. Most of the children were absolutely shocked to know that the

only defense that the body has against noise is to destroy the cilia, or cells, in the inner ear. That's the only protection a body has against loud noise.

Dr. MEYER. One of the things I would like very much to do is get in touch with you later on and have one of our staff talk to you a little bit about the scope and materials used in this course, because the Environmental Protection Agency is interested in fostering some further work about environmental ecology at the secondary and primary school level.

This is where the greatest degree of the thought formation and life-style formation takes place, and I would like to do this. We will be in touch with you.

Dr. Johnson asked a question that I was going to ask—what is the scope of the program? Because we are interested.

And I think your suggestion, also regarding a yearly anti-noise week or day is a very good one, one which I intend to look into further.

Something else you may be interested in. It was just announced last week that the Administrator of the Environmental Protection Agency, Mr. Ruckelshaus, has begun a secondary school and primary school contest relating to environmental and ecology matters, which programs like this would fit into very well.

So I do want to commend you very much for this, and to thank you for coming, and interjecting a slightly different approach.

Mrs. SUTTON. Thank you.

Dr. MEYER. Thank you very much. I hope you will stay a little while longer if you can. We are glad you brought such a fine group of people with you.

Mrs. SUTTON. Thank you. They have enjoyed being here.

Mr. BERLAND. And they are quiet.

[Laughter.]

Dr. MEYER. At this point, then, I should like to ask Mr. Larry Hodges of the Farm & Industrial Equipment Institute to come forward. It's nice to have you with us today sir.

**STATEMENT OF MR. LARRY HODGES, CHAIRMAN,
TRADE ASSOCIATION SAFETY AND ENVIRONMENTAL
POLICY COMMITTEE, FARM & INDUSTRIAL
EQUIPMENT INSTITUTE**

Mr. HODGES. Dr. Meyers and distinguished members of this panel, my name is Larry Hodges, and as the chairman of the Trade Association Safety and Environmental Policy Committee of the Farm and Industrial Equipment Institute, I have been asked to make this presentation on behalf of the institute.

Our institute, referred to as FIEI, is a trade association which was founded in 1894, and its 240 active member companies manufacture and market more than 90 percent of all farm equipment produced in the United States.

At the hearings held by the Environmental Protection Agency's Office of Noise Abatement and Control in Denver, Colo., on September 30 and October 1, 1971, FIEI, individual farm

equipment manufacturers, technical researchers, a testing agency operating under a State authority and agricultural college researchers and extension personnel submitted views in regard to the state of the art of noise control progress in association with farm equipment that's powered by internal combustion engines, and presented recommendations on future activities to optimize noise control progress.

The Denver hearings contributed much in that they reported on how a significant noise control progress has evolved with IC-powered farm equipment under a voluntary noise standards and noise abatement program.

The reports at Denver provided considerable detail concerning the individual elements and the individual activities of this voluntary system now functioning, and we are pleased to summarize these earlier presentations and place into sharper focus the resources of research, education, independent testing, and the competitive forces which make up this voluntary system and are available to allocate these resources to agricultural use noise.

To summarize the existing record, it has been shown that in response to agricultural college and industrial research, and to reports on noise levels in connection with specific types of IC-powered machines, the farm machinery industry supported the joint efforts to establish and publish conscientious and voluntary noise standards as early as 1966.

In conjunction with other Federal agencies, and voluntary standards setting bodies, the agricultural machinery industry authorized further private research to update the existing knowledge on the state of the art of noise characteristics and abatement. That intensive report was of course read into the record at Denver.

Following the establishment of voluntary noise standards, the farm equipment industry proceeded to develop and produce IC-powered farm machinery which incorporated noise abatement technology.

A Nebraska statute authorized and inaugurated agricultural tractor testing in 1920 to provide farmers with definite facts concerning the machines to be sold in that State. Tractor manufacturers wishing to sell in the State of Nebraska must test their products at the University of Nebraska Tractor Testing Laboratory under standardized test procedures developed through the combined efforts of the Laboratory of Society of Automotive Engineers (SAE), and the tractor manufacturing industry. The University of Nebraska's College of Agriculture then publishes the results of these tests.

The results are informative to consumers and thus fosters competition among manufacturers. Over the years, a substantial number of technical papers have been published evaluating the state of the art of tractor components and tractor progress as reflected by the University of Nebraska test history.

The publishing of standardized test data and technical commentary has put into the public domain information useful to maintaining a consistent machinery progress.

Consumers, researchers, engineers, and manufacturers have benefited from this unique and long-standing reporting activity. It is definitely recorded that specific benefits in mechanical efficiencies, safety, and health have been brought about through this long-standing procedure.

In 1970, the University of Nebraska expanded its test procedures to include the measurement and reporting of the bystander or the ambient as well as the operator station sound levels. Two years of published test results, by the University of Nebraska, show bystander noise tends to be within acceptable limits and trending downward. I am talking about bystander noise from tractors, by the way.

Noise levels measured at the operators station are trending downward and being controlled toward currently acceptable limits. Most recent Nebraska test reports—some have been reported since the Denver hearings—show continuing progress in noise abatement.

In turn, this information is being placed in the public's hands through normal technical reporting and in industry advertising to the consumer. The result is that the public is voluntarily investing in the new health benefits available to them.

Under the Morrill Act of 1862, the system of land-grant colleges and extension service was established. This has provided the resources whereby the technical findings of land-grant colleges in agricultural research and extension education are made available to all for the benefit of agriculture.

This process is at work through the University of Nebraska and other various agricultural colleges and is contributing to the development of noise reduction technology in connection with IC engine-powered machines in agriculture. The system of providing information to both user and manufacturer is doing much to build technical awareness of both problem and solution in the areas important to progress in noise abatement.

In agricultural noise abatement the industry has established a national noise control base through a voluntary control system already in place and functioning. It has utilized a State testing resource which is closely allied to the national agricultural extension system to record technical and health gains and communicate these gains to a nationally oriented manufacturing sector and farmers oriented to State agricultural practices.

The agricultural extension system operating at the National, the State, and at the county level is utilized in research, testing, and in consumer followup.

The industry's establishment of this voluntary noise abatement and control program in conjunction with the use of agricultural engineering school resources to test and publish has established a competitive base which has served to establish reasonable economic parameters in relation to the substantial recorded progress in noise abatement.

FIEI submits that the record shows how this existing voluntary noise abatement and control system, now functioning, is unique to agriculture. To the best of our knowledge, it does not exist to this same degree in any other industry. The key elements of the system are:

(1) Research capability with a high degree of governmental presence through USDA and the land-grant colleges created by the Morrill Act of 1862.

(2) Education by the Federal Extension Service, vocational agricultural training, Future Farmer's of America, 4-H, National Safety Council, and those being carried out by the individual companies in that industry.

(3) Independent testing and reporting of ambient and operator station noise levels by an internationally recognized testing agency of a State-sponsored activity at one of the land grant institutions.

(4) Competitive forces are at work in the marketplace for quieter agricultural tractors to meet the informed consumer demands and through the individual marketing and advertising programs of various companies in our industry.

We point with considerable pride and satisfaction to the results already achieved in a short span of time by this viable voluntary system which is quietly at work in agriculture, and urge EPA to charge this unique voluntary system with the responsibility of achieving noise control objectives. We would visualize EPA's contribution to the program as simply the synergism to insure optimum results.

Dr. MEYER. Thank you very much. Mr. Berland?

Mr. BERLAND. I don't know whether you presented data on the 1970 study on the University of Nebraska or not.

Dr. MEYER. Yes, they did. A very voluminous amount of information.

Mr. BERLAND. I am also not clear as to whether your organization supports this research. I am a little confused on that.

Mr. HODGES. Well, I would say that we foster and promote research in the public sector. This is one unique thing about an agricultural university, that they have vast research resources available, through USDA and the land-grant colleges.

The only publishable outright research that we funded was the big study at Southwest Research Institute, which was read into the record as SAE Report R-4.

But we do, as taxpayers, meet with both the State experiment stations, the agriculture engineering colleges, and USDA, to hopefully direct some of their research into fields such as noise and safety and health that are important to our industry.

Mr. BERLAND. But I sort of get the feeling in terms of EPA that you really want a hands-off policy.

Mr. HODGES. Well, we tried to point out that we think that agriculture is unique to the extent that we already have a viable system functioning. And let's let every element of that segment know that this is what we want done and charge them with the voluntary responsibility of getting it done.

Don't read into the record our thought that EPA should have a hands-off attitude as far as agriculture. We have our opportunities there too.

Mr. BERLAND. Well, let me turn around, and ask you what specifically—what role specifically you think, from your point of view, that EPA can best serve toward the fostering of this—as you term it—voluntary system?

Mr. HODGES. I guess if I was EPA, the first thing I would do would be to write the new—hopefully—incoming Secretary of Agriculture and let him know that he has an extensive research budget and you expect a sizable extent of it to be directed at the noise and at effective technology for reducing it.

Mr. BERLAND. Do you think EPA's role should be the setting of standards, decibel levels?

Mr. HODGES. If it is found necessary to set a maximum emission level, we would hope that EPA would do it, or preempt the right to others, so that we don't get a hodgepodge of regulations.

Mr. BERLAND. As I understand it, larger farms are included under labor and health standards?

Dr. MEYER. Yes, we indicated in here that they were working on a standard at the operating position. That is what he is talking about.

Mr. HODGES. In the absence of any standards at the moment, it is voluntary, plus we are working under the Walsh-Healey limits for lack of better information.

Mr. BERLAND. You don't define bystander, since it's in the previous report?

Mr. HODGES. Yes.

Mr. ELDRED. With your experience with the voluntary system, and your approach to noise, what are your feelings about—within your voluntary system—setting standards or objectives for noise? Or do you look toward simply the publication of data and a competitive spirit within the industry to just continue to drive it down to some satisfactory level?

Mr. HODGES. Well, as far as the FIEI—our trade association—is concerned, I have to say that they, as a voluntary trade association, have set no objectives and limits. And perhaps it would be frowned on in doing that.

I can say that we know that member companies have their own internal objectives which are generally based on meeting or exceeding the Walsh-Healey limits. So in lieu of any better definition—you remember, in Denver we definitely established, I think, the fact that agricultural machinery noise is considerably variable in terms of hours of exposure, hours of use. It's intermittent throughout the day, and perhaps throughout the year. Whereas Walsh-Healey is based on 2,000 hours exposure within factories.

So we are working to that and below that limit.

Mr. ELDRED. In your testimony, you talk about some of the gains that had been made in some of the other areas since 1920. I wondered, are there any examples you can give of either the gains solely through the fact that you are testing and reporting it in the competitive process, or have they found it necessary—

Mr. HODGES. Thinking back to the Denver hearing, I believe several manufacturers were asked the question by a member of the panel—What are some of the forces that motivate you to move toward this progress? And I believe in two or three instances, the first thing that was mentioned was the competitive pressure. Not the threat of possible regulation.

And so I believe that it is this uniqueness of testing and reporting in agriculture, plus the total awareness in society of the noise problem, that has motivated the industry to move as far and as fast as we have, and we still have our opportunities.

Dr. MEYER. What happens is that they publish a book which shows all the tractor characteristics, including noise levels, measured in accordance with the standards that they have adopted for the test procedure. And if anybody wants to buy a tractor, he opens up that book and you can see them all laid out very neatly, so that it does, I am sure, force some degree of competition to be sure that they get a little better than the other one.

The thing I found so interesting was that apparently the mid-western agricultural States depend on Nebraska. This one State, because it is widely publicized, impacts the whole industry because of its action. There is no enforcement other than the fact—correct me if I am wrong—that they can't sell a tractor in the State of Nebraska, which is a fairly good size agricultural State, unless it's been tested and the results have been published.

There is no standard as far as the State is concerned. It just says, if you want to sell, you must bring your tractor in and have it tested and the results must be published.

Mr. HODGES. Their only pass-fail ruling is that they won't issue you a permit to sell based on the test if you didn't equal or exceed your advertised performance for the product.

Mr. BERLAND. Ken raised a word that I would like to pick up—labeling. We have heard testimony that one trade association set up a voluntary labeling practice among those members that would subscribe to this plan, and I guess most of them did, where they not only tested, but labeled, so the consumer who didn't get the book could tell what the noise level of the product was in the marketplace. Are you considering anything like that?

Mr. HODGES. Well, the present state of the art is that any labeling of the noise emission level has to be tied to a standard of measurement, so that results are repeatable and consistent.

And at the moment, we don't feel that our standards and techniques for measuring at the end of the product line are sufficiently refined and accepted that we are willing to do that on a voluntary basis.

Mr. BERLAND. Well, that negates putting it in the book, then, doesn't it?

Dr. MEYER. Let me see if I can answer that for the witness. What they are saying is that the product that comes off the production line has got to meet the standard, but under the circumstances of agricultural use.

Mr. BERLAND. All I am asking is, whether they haven't considered putting that standard right on the vehicle. I'm talking about in point of sales.

Mr. HODGES. I can only say for the industry that that point is under discussion, but as a manufacturer, there are certain product liability implications when you do that, and so we have not yet elected to put a label on that says what is the emission level of this product.

Mr. ELDRED. Do farmers when they are buying the equipment actually use these books at the dealers?

Mr. HODGES. Oh, absolutely. They brag about the fact that they bought a certain kind of tractor, because it outperforms the one you've got down the road. See, it's right here in the book.

Mr. MARTIN. Just to follow the same trend—do the advertising literature and service booklets that you put out with the vehicle contain the results of the tractor tests?

Mr. HODGES. I know of several manufacturers that do. I think the record should show that the State statutes in Nebraska prevent any paraphrasing or reference to the Nebraska test without quoting the entire test.

So in company advertising, you can use such language as "according to official tests, we have done thus and so." And you can quote a decibel level.

But if you say, "according to Nebraska Test No. 1013, . . ." you must then quote the text. And this is done, of course. The entire text of the report is published in various advertising things; and the trade papers that service the industry regularly publish the total test result.

Dr. JOHNSON. On page 3 you indicated that you do use normal technical reporting. On page 4 you said you do provide information to the user. And you use a national noise control base. Now a previous witness told us what that was.

But the thing that puzzles me, I have an 18-horsepower farm tractor which would cause me—

Mr. HODGES. Incidentally, I believe by definition that is a lawn and garden variety tractor, and not a farm tractor.

Dr. JOHNSON. Maybe so. It's over 10 years old, and it was sold for agricultural purposes, not for lawn and garden. And I don't use it in the lawn and garden, I use it on a farm, for farming purposes only.

And if I were to operate that machine 8 hours a day, it would cause me a hearing loss.

Now my neighbor has a newer machine, about 15 months old, and it's up around—it's less than 60 horsepower. I can normally hear that tractor at a distance of a half mile, and he's within 6 feet, so I am sure it affects him, with the noise it radiates.

I also was shopping for a new tractor, and looked at three different brands and found nothing on the noise radiated from any of these three.

So I am kind of puzzled when I hear your fine report versus my own personal experience. By the way, I am from Pennsylvania, not Nebraska.

Mr. HODGES. I would say we have already answered the question, that there is no program to label noise emission levels. But I again come back to the fact that every tractor that is sold, that has been tested in the State of Nebraska, the results of the noise levels, for 2 years only, have been published, and many manufacturers in our industry are making considerable advertising hay—if you want to call it that—out of the lower noise levels that we have been achieving lately.

Dr. JOHNSON. Yet you don't feel that someone like EPA should try to make this a national thing? Just let the States pick it up if they want?

Mr. HODGES. It depends on what you talk about EPA making as a national program.

Dr. JOHNSON. Well, the kind of program that Nebraska has, for example; that's a good one, don't you think?

Mr. HODGES. My feeling is that since Nebraska has been established as far back as 1920—that's 51 years—they are an internationally recognized testing agency. We are in the final phases of negotiating with European operations to interchange and accept Nebraska test as the official test in lieu of the European test.

Dr. JOHNSON. How about Pennsylvania?

Mr. HODGES. Pennsylvania can impose that as a condition of sale if they like.

Dr. JOHNSON. In other words, you are not recommending that we have this as a regulation?

Mr. HODGES. I would hope that every State wouldn't decide to start a Nebraska testing program on their own.

Dr. JOHNSON. My question is whether or not we should have some uniformity in order to help protect the consumer.

Mr. HODGES. I guess the point of our pitch is the voluntary uniformity. All the bricks of that program are in place in agriculture, if we elect to tell them you are responsible to get this job done.

Dr. JOHNSON. I'm afraid I don't understand your answer to my question. Maybe you don't understand my question. Should there be a national standard or a national method such as Nebraska has, or should you leave it up to each State, or each section, or how would you recommend that such a program be promoted, or do you recommend that we not do anything about it?

Mr. HODGES. No, I recommend that the present program be vigorously supported. Pennsylvania has a land-grant institution, they have an agricultural research—

Dr. JOHNSON. Yes, I know that. If it wasn't for that, I wouldn't be able to feed my children.

Mr. HODGES. I think the point is to get at these four key elements of research, education, and we have already got a consumer testing agency, and the competitive forces, and say, get the job done.

Dr. JOHNSON. I am not making any headway.

Dr. MEYER. Let me see if I can try my hand at it. Do you think, in the interest of national uniformity, as a first step pending passage of any legislation, that EPA ought to undertake wide publicity about the availability of this information so that people in Pennsylvania, Louisiana, or California, who want to buy a tractor, would perhaps ask for that red-hat book that I saw in Denver, and at least look at it, and buy the least noisy one available?

That would be a first step. In other words, wide publicity as to the availability and existence of this data, in and of itself, would focus attention on the fact that in the competitive market

there are differences, but at least there is a place where the major manufacturers have indeed submitted themselves to scrutiny.

Would you think that would be good as a first step?

Mr. HODGES. Rightly or wrongly, our assumption is that that is being widely disseminated through the media that I have talked about. If there is evidence there are lots of consumers that aren't getting it, and you can promote wider dissemination, we would definitely promote that kind of a program.

Dr. MEYER. If I understood you correctly, what you are saying is that rather than set up a whole new national test center, say in each State, we ought to follow Nebraska—assuming some uniform standard approach was going to be set up, we ought to take a look at the bricks and mortar and cement that are all in here and mix them together to make a structure, based on—as you indicated—the existing internationally recognized scheme.

Is it correct to assume that that is what you meant toward the end of this?

Mr. HODGES. Right. Making sure that all four of the individual elements recognize what the priorities are and urgencies are and that they are contributing at the rate we need to get the progress we need.

Dr. MEYER. Dr. Johnson, does that clarify your questions?

Dr. JOHNSON. I think I understand his position, yes. Thank you.

Dr. MEYER. Mr. Martin?

Mr. MARTIN. No questions.

Dr. MEYER. Dr. Dietrich?

Dr. DIETRICH. I'd like to delve into something that you have said in response to Dr. Johnson. You gave two possibilities through the explanation of why he was apparently unable to find noise data about the new tractor when he went to buy one. One of them, as I understand it, was that he might have been looking at a product that wasn't really agricultural equipment as that falls under Nebraska rules, is that correct?

Mr. HODGES. No. Actually the tractor that he defined was sufficiently old that at that time it was produced it fell in the classification of agricultural tractor. But the horsepower have moved up to where that category comes under lawn and garden now.

So I jumped too soon on that answer, before he told me how old the tractor was.

Dr. DIETRICH. But would it be possible that someone going into the marketplace, perhaps in another State entirely, and still not Nebraska, might find the information doesn't exist, solely because it's a lawn and garden equipment, even though it's called a tractor? And you are telling me, if I understand you correctly—correct me if I am wrong—that there is no comparable testing of these lower horsepower tractors?

Mr. HODGES. That's correct. By definition, both in the SAE standards, and in the Nebraska administration of the law, you must have 20 or more horsepower to have an agricultural tractor.

Mr. MARTIN. May I just interject a comment? I think we are—and you haven't mentioned this, Larry—the noise requirement in the Nebraska test code is rather new. If you look in the booklet.

Mr. HODGES. We have been working for about 5 years with them to refine the techniques, but they have only published for 2 years—1970 and 1971.

Mr. MARTIN. There are many tractors, even in the reports that are published, that have not got noise test data yet because they haven't gone through the cycle.

Mr. HODGES. Only tractors tested in calendar 1970, and this portion of 1971, have published tests data.

Dr. DIETRICH. That was my next question, that not all the tractors on sale have yet been tested for this noise.

Mr. HODGES. That's correct, for that reason.

Dr. MEYER. For the record, since this transcript will undoubtedly be widely procured, would you mind mentioning how a copy of the latest reports of the testing procedure can be obtained?

Mr. HODGES. They can be obtained by writing the Tractor Test Board, University of Nebraska, in Lincoln, Neb.

Dr. MEYER. Well, thank you very much. This is a useful idea as to how some evidence can be made that may be applicable, under our stimulus, to other areas of activity. We look forward to continuing to work with you on this. Thank you very much.

Mr. HODGES. Thank you.

Dr. MEYER. I'd like to now move up not necessarily in size because some agricultural equipment that is internal combustion-powered is getting up to be as big as some of the small elements of Mr. Larmore's concern. But I'd like to ask Mr. Larmore from the Construction Industry Manufacturers Association to talk to us about some other types of heavy equipment that produce noise. Mr. Larmore?

**STATEMENT OF MR. H. T. LARMORE, DEPUTY
DIRECTOR, FOR TECHNICAL AND SAFETY SERVICES
OF THE CONSTRUCTION INDUSTRY
MANUFACTURERS ASSOCIATION**

Mr. LARMORE. I sort of like the way you described construction machines. I have heard them called many things a lot worse.

For the record, my name is H. T. Larmore, deputy director for technical and safety services of the Construction Industry Manufacturers Association, which we shall call CIMA.

In the interest of the panel's time, we would like to do a little capsulating at this time, and to note that previous CIMA testimony presented at the EPA hearing in San Francisco on September 27 through 29 of this year, elaborated on the membership of this organization and the broad spectrum of construction equipment manufactured by its members.

As an aside, we also made it quite clear that we thought, at least in our opinion, that the activities we had generated over the past several years made us uniquely qualified to testimony to some elements of noise abatement for construction machines.

It is our intent at this hearing to address various economic factors related to noise reduction of construction equipment.

present some statistics which suggest where the primary thrust of investigations, standards development and enforcement might be concentrated. I shall also highlight the pertinent points of previous testimony given by CIMA and individual CIMA members at the EPA hearings in Atlanta and San Francisco.

Generally speaking, manufacturers of construction equipment acknowledge the fact that many of their products are noisy. Previous testimony has pointed out the extremes of variability involving sizes and types of machines, mounted tools, machine groupings and job site conditions—all having a major bearing on the noise level of any specific job site. Obviously, although a construction machine does contribute to the noise impact of a construction job on the nearby community, it should not be singled out from the total construction process.

It might well be asked why construction sites are usually noisy and why so little has been done to alleviate this situation. A review of a Department of Commerce publication entitled, "The Noise Around US"—Incidentally, Dr. Meyer, these references are attached to the testimony, and I will not take the time to read them through.

Dr. MEYER. They will follow the testimony at the appropriate points.

(The reference No. 1 follows:)

THE NOISE AROUND US—INCLUDING TECHNICAL BACKUP

1. THE ECONOMICS OF NOISE ABATEMENT AND CONTROL

Noise is a form of environmental pollution, analogous to air and water pollution. Like these other forms of pollution it has economic dimensions, both with respect to generation and to abatement and control. Noise has some similarities with other forms of environmental pollution, but also some important differences. Noise pollution is like air and water pollution in that it arises as a byproduct of important and desirable social and economic functions and processes. However, it is unlike these other forms of pollution in important ways:

Unless the producing process continues, noise dies out rapidly.

Noise generally dies away rapidly as one's distance from its source increases.

These two properties of noise—that it dies out rapidly with time and with distance—make noise much more of a *local* problem than other forms of pollution. Only in our great cities, where tens of thousands of local noise problems coalesce into a large continuous mass, does the noise problem begin to betray the wide-area properties that we associate, for example, with air pollution.

These two properties play key roles in determining how we must design our responses to the noise problem, and they are important factors in the economics of noise generation, abatement, and control.

7.1. An Economic View of Noise

Most of the noise that we are subjected to today emanates from final products, or is emitted in the process of producing final goods and services. It is an unfortunate fact of life that it generally would cost the producer of products, goods, and services more to give these end items quieter properties, or to produce them in a quieter manner.

If we assume an economy in which price competition plays a central role, and in which profit maximization is an important goal for a firm, then the firm's products and services must be produced as inexpensively as possible (given a fixed quality level), in order to obtain wide acceptance in the marketplace. A simple corollary is that features without marginal value in the marketplace will be omitted, even if their production cost is low—and such features often include quieting ones.

There is, in an economic sense, no noise problem if the costs of the emitted noise are kept internal to the person or firm that produces them—there is no problem until an outside third party is affected. For example, if a firm has a noisy production process, and labor considers such an environment to be a health hazard, then the firm will have to pay higher wages to attract men to work in the noisy areas. Similarly, it will have to bear the costs of any decreased worker productivity that may occur due to the noise level.

A process whereby a firm pays for the noise it emits is known as "internalizing the costs" of noise. If the firm finds this noisy process to be the most profitable one after the noise costs are taken into account, then it is behaving in an economically logical manner when it produces noise as a byproduct. Similarly, a housewife who buys a noisy product rather than a quiet one of the same type is internalizing her costs if she is aware of the annoyance the product may cause her, yet still decides to accept it.

The economic problem of noise arises when people not involved in the noise-producing activity or process are affected by it. In such cases, costs—known as social costs—are imposed on others, who have nothing to do with the production of the noise, and who are not compensated for the increased health hazard or annoyance to which they are subjected. When this situation occurs, an external diseconomy is said to exist. This inevitably leads to unfair situations—benefits and costs do not accrue properly to whom they should, and our free market system does not adequately impute pollution costs to the producer; they are borne by the public as social costs.

Consider the case of the resident whose home is next to a construction site where numerous jackhammers, piledrivers, and air compressors are in use. All the benefits of being able to perform the construction in the most profitable way (i.e., noisily) accrue to the construction firm, but only the private internal costs of construction are paid by the firm. All the social costs of the resident's inability to sleep, concentrate, or carry on a normal conversation accrue to the unfortunate homeowner, not to the construction firm. The resident must, in effect, pay for the firm's freedom to emit noise pollution.

Whenever a factor input closely associated with a production or service process is under- or overvalued, the market's pricing system, which normally allocates resources in an efficient manner, does not function properly. To apply this concept to the case of noise pollution, we need only recognize that the normally quiet environment is one of the natural resources used up in a noisy production or service process. Thus, society tolerates as much noise pollution as it does today because its attitudes, and resulting market processes, undervalue the quiet environment.

In the market as it exists now there is no mechanism for measuring the value of the absence of noise, nor is there any way a producer can be charged for using up a portion of the quiet environment. As a result, a quiet environment is considered to be a free good, and more of it is used in a production process than is economically desirable, since the resource price of silence is under-valued. Private costs become less than social costs in this case, and the resource is used wastefully. Consequently, more noise is emitted than is desirable from society's point of view, since the market does not adequately impose pollution costs on the producer.

The market distortion does not stop here, though. If a good or service is produced in a noisy fashion, the final selling price is lower than it should be because the true values of the inputs that went into the production process have not all been paid for by the firm (since silence was undervalued the firm did not have to pay for its use). Thus, the price of the good or service is lower than it should be, and does not represent the full costs to society of all the inputs that went into its production. Consequently, more of the good or service is produced and sold than is economically efficient—once again with benefits and costs not accruing properly. Purchasers or users benefit by paying a reduced price, but the costs accrue to those affected by the noise emitted in the production and use processes.

Finally, the consumption of noise abatement can be both individual and collective; that is, once produced, quiet is available to everyone to consume without charge—a classic problem of market failure. Some consumers thus can benefit from noise abatement financed by others, and are not motivated to pay for abatement on their own.

Since economic considerations occupy a central place in the noise pollution problem, solutions that make appropriate use of economic forces are more likely to be easy to implement and have more far-reaching and lasting effects

than those which conflict with these forces—even though it seems unlikely that the problem can be solved entirely through the traditional workings of the marketplace.

A review of that publication makes the point that up until now "there is no mechanism for measuring the value of the absence of noise nor is there any way a producer can be charged for using a portion of the quiet environment."

Construction contractors have not been motivated to engage in research for methods to reduce noise and have not asked manufacturers for quieter machines. Thus, the machinery manufacturers have not in the past concentrated their research efforts on noise reduction for their products but, instead, have developed machines to respond to user requirements for increased productivity and lower costs per unit of work output.

Unfortunately the current state of this relatively new art—referring to noise abatement—doesn't offer ready solutions to major noise reductions for most construction machines. There doesn't seem to be any imminent technical breakthrough which can overcome this problem.

Previous testimony has demonstrated that noise reduction is a step-by-step process of analyzing each noise producing element of a machine and reducing it to a level which is below the dbA level of other sound-producing components. It is an expensive and time-consuming process.

One company in earlier testimony has indicated that in general, modifications to new machines currently being manufactured could reduce noise output from 3 to 8 dbA at a cost penalty of 1 to 3 percent with a development time of 2 years. An additional 3 to 6 dbA reduction could be achieved at a cost penalty of 10 to 25 percent and be accomplished over a period of 5 years. These figures are only estimates but they emphasize the additional costs of construction if overall stringent noise levels are applied to all construction machines regardless of how or where they are used.

In various studies of environmental noise, emphasis is primarily given to urban areas of high population density. Demolition and construction have in many of these locations become almost a continuous process. This is in contrast to highway and civil works construction projects which, when completed, are utilized for many years without new projects being undertaken nearby.

In these latter cases, the projects are completed and the crew moves on. The noise in one specific location is of a temporary or transitory nature and it usually occurs in a rural or unpopulated area. If the population density exposure and the time exposure were comparable, then regulations could also be justifiably comparable.

A review of Bureau of Labor statistics information reveals that there is a substantial difference in the expenditures for machinery used for buildings (1 to 2 percent of project cost) compared to the machines used on highways, 12 percent, and civil works—land projects, 20 percent.

This is referenced in attached reference No. 2.

(Reference No. 2 follows:)

(Reference No. 2)
ECONOMICS OF THE CONSTRUCTION INDUSTRY
 (By Peter J. Cassimatis, Associate Professor of Economics,
 Fairleigh Dickinson University)
 (The Conference Board, Studies in Business Economics, No. 111)

MATERIALS REQUIREMENTS

The inputs of materials and equipment in construction activity are even greater than the inputs of onsite employment. A measure of inputs is provided by the distribution of the factor costs of major types of construction using BLS data (table D4).

It can be seen that, for every \$1,000 of new construction, about \$300 are expended on wages for construction workers, \$500 on materials and equipment, and \$200 on overhead and profit.

Differences in materials requirements for the various types of construction reflect the cost of materials of construction or structural components. For example, civil work projects such as dams, tunnels, and ports require large amounts of mass-produced materials such as concrete, steel, asphalt. Building construction requires relatively many types of materials but in small quantities.

TABLE D4: PERCENT DISTRIBUTION OF FACTOR COSTS OF SELECTED TYPES OF CONSTRUCTION

Type of construction	Onsite wages	Materials and supplies	Equipment rental or depreciation	Overhead and profit
Single houses	22.0	47.0	1.0	29.0
Public housing	35.3	45.0	2.5	17.0
College housing	29.3	52.6	1.6	16.5
Highways	23.9	50.6	12.0	13.5
Schools	25.7	54.1	1.4	18.8
Hospitals	28.6	53.3	1.1	16.8
Office buildings	29.0	51.3	1.9	17.8
Civil works—land	25.0	55.0	20.0	20.0
Civil works—dredging	22.5	17.5	25.0	25.0

Source: Calculated from data published by the Bureau of Labor Statistics, Bulletin Nos. 1299, 1331, 1340, 1362, 1390, 1402, 1404, 1441, 1490.

Equipment costs are relatively a small portion of construction activity, except for highways and civil works. These two types of construction involve moving equipment of huge size for earthwork and lifting of heavy materials.

Although construction requires a very large number of materials or fabricated products, on the average 80 percent of these were accounted for by five types: stone and clay products, 28 percent; lumber products, 10 percent; metal products, 25 percent; plumbing and heating, 15 percent; electrical products, 10 percent.

The above distribution of materials also suggests the type of labor, i.e., craft skills, required for major types of construction. A breakdown of the man-hours onsite shows that four trades—masons, carpenters, plumbers, and electricians—perform the bulk of construction work, and receive two-thirds of onsite wages.

It can easily be seen that increases in machinery cost will be reflected to a much greater extent in project costs on large rural earthmoving jobs rather than on building projects. In other words, the cost/effectiveness ratio of noise reduction is far better in urban areas. It would therefore seem appropriate that current efforts of noise reduction on construction equipment be initially limited to urban site construction.

It is interesting to note that government, i.e., Federal, State and local, is the largest customer of the construction industry. In a conference board article entitled, "Economics of the Construction Industry," the author states: "The share of public construction in total construction has increased from 22 percent in 1945 to 35 percent in 1967. It is generally believed that this trend will continue."

And I am quoting from reference No. 3.
(Reference No. 3 follows:)

(Reference No. 3)
ECONOMICS OF THE CONSTRUCTION INDUSTRY
(By Peter J. Cassimatis, Associate Professor of Economics,
Fairleigh Dickinson University)
(The Conference Board, Studies in Business Economics, No. 111)
THE NATURE OF CONSTRUCTION

Construction is an ubiquitous activity. In general, "construction" refers to all types of construction activity usually associated with the erection and repairs of immobile structures and facilities, such as buildings of all types, highways and streets, ports and airports, dams and conservation projects, railroad lines and canals, and other similar types of work.¹
"Contract construction," however, refers to an industry consisting of a large number of firms that perform construction work for others. Consequently, statistics of construction are often misinterpreted because some statistical series refer to the contract construction industry and others to construction activity.

PLACE OF INDUSTRY IN THE ECONOMY

Size of the industry

Construction activity in the United States totaled \$100 billion in 1967, or about 13 percent of the GNP. New construction put in place accounted for \$76 billion; the remaining \$24 billion was expended on maintenance and repairs. The contract construction industry's total business receipts are currently estimated at \$90 billion.² (Chart 2.1).

The share of the contract construction industry is said to range from between 85 percent and 90 percent of all construction activity.

The remaining 10 percent to 15 percent of construction is referred to as force-account construction, and it is performed by the owners of the structures utilizing their own labor (i.e., do-it-yourself construction). Since the contract construction industry has business receipts equal to 10 percent of GNP, it is obviously one of the crucial sectors of the economy, both in terms of private enterprise and government planning.

GOVERNMENT SPENDING

The government plays a significant, if not dominant, role in construction activity.

During expansion, the rise in government construction expenditures seems to coincide with increased activity in the private sector. In time of recession, government activity nearly always exceeds the construction generated by all others. As market conditions ease and commercial bank credit is more readily available, first the residential construction and then the industrial construction sectors begin to expand and once again catch up with government in both outlays and physical output.³

Problems of public policy

Government is the largest customer of the construction industry. In 1967, \$26 billion of the total construction activity was for public construction projects, representing 15 percent of government purchases of goods and services.⁴ One third of these expenditures was for federally owned construction, the other two thirds were for State and local government construction.⁵ The share of public construction in total construction has increased from 22 percent in 1945 to 34 percent in 1967.⁶ It is generally believed that this trend will continue. Government is also a principal source of financing construction activity. In 1967 about 18 percent of all private home construction was financed by Federal Government mortgage insurance programs.⁷ This dual role of government—principal purchaser⁸ and lender to construction—exerts an enormous influence on the structure and performance of the industry.

Finally, we must consider the importance of research and development either sponsored or induced by government in order to encourage innovation and economies of scale.

¹ Mobile homes and travel trailer construction are not included in construction because they are products of manufacturing.

² *Construction Review*, December, 1966, p. 4.

³ *Survey of Current Business*, "Income and Product Accounts," July, 1966, p. 7.

⁴ *Construction Review*, July, 1968, p. 14.

⁵ *Idem*.

⁶ U.S. Savings and Loan League, *Savings and Loan Fact Book* (Chicago: 1968), p. 89.

On the trial basis it would appear that the Federal Government, through EPA, is in the best position to initiate pilot cost studies. On certain selected contracts, the Government could specify maximum noise levels for the construction site. Separate accounting could be established to determine the costs, record the techniques used to limit noise radiation and note compliance difficulties. This approach would provide some preliminary data that would indicate the range of costs that could be expected in order to achieve a quieter environment.

We believe that the pilot program approach will accentuate the complexities of the total problem and forestall a crash Band-Aid solution in deference to a systematic R. & D. program that will offer the opportunity to evaluate the major relevant factors and the additional economic burden on the public for noise abatement.

It also could provide some guidelines or parameters of tolerable annoyance levels that the public is willing to accept.

As stated in previous testimony, the Construction Industry Manufacturers Association and its member companies offer our services and strongly urge that we be given the opportunity to participate fully in the area of our particular expertise. We believe that only by involving all interested segments of the construction industry, the public, and the government, can full consideration of research and test data, safety factors, economic reasonableness and technological practicability, be incorporated in drawing up future regulations.

We believe major points made in previous testimony warrant a synopsis treatment at this final public EPA hearing prior to submission of recommendation for legislation to the President and Congress.

(1) Member companies are working on machine noise reduction now and are faced with the necessity of pushing the threshold of the art onto new technological ground.

(2) In response to CIMA performance standards action, various standard writing bodies, including SAE, are working diligently on establishing uniform, definitive and repeatable noise measurement standards. Such standards utilize the widely used and accepted noise measurement unit of dbA and our industry is conducting its research and development accordingly.

And we reference our attached reference No. 4.

(Reference No. 4 follows:)

We strongly oppose reported current efforts by some noise technicians to develop a different scale. Such action could seriously delay the noise abatement effort by causing several years of noise measurement to be restudied.

(3) Our member companies generally do not oppose realistic individual noise limits for selected machines measured under standardized conditions and test methods to give the repeatable results necessary for any certification or labeling requirement.

(4) Our member companies do not oppose individual machine noise output labeling. However, we do not think that labeling requirements should be applicable to export shipments until such time as this may become a requirement for all manufacturers in the international area.

(5) CIMA strongly recommends that standard measurement methods, maximum dbA levels for individual machines, and labeling requirements have national uniformity for the reasons outlined in previous testimony.

(6) Our members generally believe that national noise limit standards could apply to selected individual machines, but control of the total jobsite noise impact on the adjacent community should be a State and/or local government prerogative.

The Construction Industry Manufacturers Association is most pleased to have had this opportunity to testify at these national EPA noise hearings. We support the obvious and laudable intent of EPA to approach the complex problem of noise abatement on the basis of all available information and facts—and to replace possible panic legislation and regulation with constructive planning that reflects the capabilities and total needs of our society.

Dr. MEYER. Thank you very much, Mr. Larmore. I will ask Dr. Dietrich if he has any comments or questions.

Dr. DIETRICH. I just have one. It has to do with item 6 that you just made reference to, which had to do with the belief that national noise limits are appropriate for individual machines but when you get into the situation of the construction site noises, you believe it's a State or local government prerogative.

I wondered whether you would stretch that recommendation to include such things as interstate highway construction carried out by the highway administration, or whether you believe this is some role for Federal guidelines or Federal requirements for construction site noise for very specific kinds of projects, and I had in mind just that one.

Mr. LARMORE. Well obviously we tend to generalize in this type testimony. The relationship of federally financed projects going through the local government territories is a rather complex situation, and it would be my personal observation, however, that, normally speaking, if there is overwhelming need to control community noise impacts, that it should be controlled compatible with the local requirement regardless of whose job it is.

Dr. DIETRICH. I appreciate what you are saying, and indeed, it must reflect an attempt to meet local needs. But one of the arguments for having—what should I say?—some Federal guidelines in this particular area is that contractors who build this kind of construction, build sizable amounts of it, and, reasonably enough, they might look forward with some distaste to finding that as they bring their construction crew into the vicinity of this small community A, that they need one kind of consideration and equipment and control of noise, and as they go next into community B, they have to somehow rejuggle their equipment.

I would think they would be a little upset over the impact on the efficiency of their work.

Mr. LARMORE. I would agree. If I might clarify the issue a bit, the essence of our recommendation is, of course, that in goods in interstate commerce, we are talking about the tools of the—the noise producing tools, if I might say this—will have to be controlled on a national uniform process.

I heard a great deal of debate in other hearings to establish that this is not an attempt to be a federalist or a States rightist. This is simply, the thrust of this recommendation is that it must be uniform because not only are our machines sold and shipped in interstate commerce, but our contractors are using elements, as you have just indicated, that are also in interstate commerce.

Now on the other side of the ledger are the many things that can be done at the user level and at the community level, at the site of the job, which is not a machine noise, now, it's a cacophony of a total jobsite, it's a process, it's a construction process noise.

And here it would appear most reasonable that—let's assume that this is an interstate highway job, just for example—that those known regulations, for that portion of the job that passes closest to a hospital, for instance, that this be a part of the jobsite, of the job specifications. That this is known to all bidders before they bid, and that the interests of competitiveness and forward planning is not disturbed.

Dr. DIETRICH. Thank you very much.

Dr. MEYER. This last is a very important consideration, I think. The people who let the contract have the obligation to include some basic specifications, as does the manufacturer of equipment that is going to be used.

Mr. MARTIN. In line with that, would you then be in favor of the EPA establishing model rules for construction sites in these various areas, so that these would be used as a basis for community construction site type rules?

Mr. LARMORE. Yes, Hank. Our experience in other areas of enforcement and government control would indicate that there is a strong and urgent need for technological or enforcement procedural help on the local government levels. This I think is amply demonstrated by some of the prior testimony that without standard measurement methods, without something that can be repeatable and stand up in court and so forth, we have very little that is effective.

And it would be our hope that EPA—or whatever agency in Washington is given this responsibility—would make it a part of their responsibility to make such guidelines available to all governments.

Mr. ELDRED. In the case of trucks, there is considerable evidence that there is a problem in keeping the noise of the truck, after it has left the manufacturer and is in the hands of the user, as quiet as when it left the manufacturer, because of maintenance, repair, and changing components.

I wonder if in the construction industry you are also subject to user change, like throwing away mufflers, et cetera?

Mr. LARMORE. You better believe it.

Mr. ELDRED. I wonder if you have any suggestion on what EPA might be able to do to prevent some of these practices?

Mr. LARMORE. Yes. I think we do. And I believe it is inferred in the testimony, but let me just make the point.

As we understand the situation, the main objective of all that we are talking about—and let's zero in on community impact at the moment, as opposed to risk of hearing loss—when we talk about protecting the community from unwanted noise, and in

this particular case from construction, we think the responsibility should be of a control which says that without regard to what generates the noise, that this responsible person—the people responsible for this construction process should have some limits to work to.

And as some members of your panel are well aware, we have testified previously about our participation in encouraging certain types of elementary standards that are so vital to this process. And one of these, which is proceeding posthaste at the moment within SAE, of course is measurement techniques for jobsite noise.

Now this ignores completely the individual noise generators on a job, and speaks to the end result of what comes across the jobsite limits and impinges upon a surrounding community.

And I think this may be a long answer to a short question, which is, regardless of what the mechanics on the job do in pulling mufflers or taking off encapsulation side plates and throwing them in the corner, and so forth, there is a measure of control that I think is most effective.

Mr. ELDRED. Thank you.

Mr. BERLAND. Just one comment about your statement. I think it would be useful for the record if it somehow indicated the dates of the reports from which these pages are extracted. It was probably left off in reproduction—the references at the back.

Mr. LARMORE. The references are attached, sir.

Mr. BERLAND. But I can't tell where they came from.

Dr. MEYER. His question is, for instance on reference No. 3—2 and 3 don't have dates on them.

Mr. LARMORE. Oh, on the attachments? This is a complete oversight. I agree with you.

Dr. MEYER. It would be useful to have it. Would you like us to amend it? Just let us know what the exact dates are, so it does give us a point in time.*

Mr. LARMORE. Thank you for bringing this up.

Dr. MEYER. With regard to that, I'd like to ask a question—oh, excuse me, Mr. Berland, I thought you were finished.

Mr. BERLAND. No, I'd like to ask a few questions.

Dr. MEYER. Go ahead, you have the floor.

Mr. BERLAND. I don't know whether I agree with you, sir, about the noise of roadway and highway construction, because while I think it's true that, in total mileage most of the roadway construction in the United States is outside of metropolitan areas, still a large proportion is inside metropolitan areas and becomes even more objectionable in terms of noise in an urban city situation.

*The following precise identification of the references included with the above testimony was submitted to the Office of Noise Abatement and Control:

Reference No. 1.—"The Noise Around Us," OOM 71-00147, U.S. Department of Commerce Publication 1-70.

Reference No. 2.—"Economics of the Construction Industry," Studies in Business Economics No. 111, by Peter J. Cassimatis, 1969, National Industrial Conference Board.

Reference No. 3.—"Economics of the Construction Industry," Studies in Business Economics No. 111, by Peter J. Cassimatis, 1969, National Industrial Conference Board, pp. 10, 11, 4, 25.

Reference No. 4.—"A Study of the Magnitude of Transportation Noise Generation and Potential Abatement," Report No. OST-ONA-71-1, Department of Transportation, November 1970.

So I wouldn't go along with your exempting or putting aside another category of roadway construction. I think it's just as important to control the noise of equipment on these. I was wondering—

Mr. LARMORE. Might I speak to that? Just quickly. It's not our intent to flatly say that there is a category that doesn't apply and there is a category that does. Our objective in this kind of testimony is to try to paint a picture of what it is like out there in the real world.

And if we are concerned—and I think the American public is concerned—about the total needs of the society and their capability to achieve all of those needs, that there may be a sense of priorities that might be established, as EPA or others within Government complete these rather massive studies and constructively plan for our quieter future.

This is our only contention.

Mr. BERLAND. It is your suggestion of what you think of the order of priorities?

Mr. LARMORE. That's correct.

Mr. BERLAND. I wonder what impact on your industry or on individual manufacturers the Chicago law specifically has had, which does encompass noise produced by construction equipment, exempting pile drivers. Has it been ineffective, or can you talk to that?

Mr. LARMORE. Well, it isn't in effect, of course. There has been no impact of this because of effective dates and so forth. We have worked with the city of Chicago, and I might indicate that Casey Caccovary is a very productive member of this SAE committee which is working on jobsite noise, and together we are learning a great deal.

We have been on some of Casey's typical downtown jobsites, and this is both industry and users and government. HUD is involved, and Casey, of course, and his people.

I think that as laudable as the Chicago noise ordinance might be, that it really has had little or no impact at the moment on construction machines and construction noise. And I would expect to see a great deal more generated in that area, and hopefully, I would hope that we might have some national uniformity-type regulations coming out of Washington before the city of Chicago decides to move forward, because frankly, they are establishing marketing standards for machines that I think we—as others have testified and as we concur—this is more properly the prerogative of a national effort.

Mr. BERLAND. I like the idea that you put forth on page 4 that the government specify, in its contracts on construction and demolition, maximum noise levels for the construction site.

Is it your feeling that if the government were to do that, that it would then carry over to the private sector, as far as specifications on contracts for construction and demolition?

Mr. LARMORE. Well, it already is in some cases, on a local basis. The thrust of our suggestion, I believe, on the page that you are talking about, is that government, perhaps without a great deal of extra expenditure, because of their wide variety of being a customer of the construction industry, might select, with or with-

out help, certain jobs and run real cost studies and procure a great deal of data from one or more of these kinds of contracts which would be most helpful in setting the pattern for future regulations.

Dr. MEYER. I think your suggestion is an important one. It is one that our office should follow up with the office of the Chief of Engineers, who has Army and Naval Facility Engineering Command, and the Director of Civil Engineering of the Air Force, and the General Services Administration.

And I do want the record to show that we will accept that as a chore to do, that we will get together to see what, if anything, can be done about trying this idea out. Go ahead, Ted.

Mr. BERLAND. Do you know of any industrywide or any industry-sponsored research toward new kinds of technology in construction that would be quiet? We have heard talk in New York, as well as in Europe, in terms of different kinds of pile-drivers, sonically generated. There was a demonstration in New York of a cookie-cutter for opening round holes in the street, rather than an impact device like a jackhammer.

But do you know of such research sponsored by your industry toward achieving new kinds of technology for doing the old job better and quieter?

Mr. LARMORE. Not as an industry. The restraints, we recognize, rather effectively prevent this. We are operating in concert in all areas where we feel we can legally do so.

So my answer to your question is, as an association or as a grouping of individual manufacturers, this is not being done.

As for individual manufacturers, I think you will find in previous testimony, particularly that given in Atlanta, earlier this year, that a great deal of work is being done in this area. This is in the normal marketing, R. & D. type of operations of a manufacturer or corporation.

Mr. BERLAND. Normal for better, but not always for quieter.

Mr. LARMORE. Well, this is the problem of trying to determine some 4 to 5 years in advance—or depending on what your R. & D. time frames are—what the demand is going to be.

Dr. MEYER. I have only two questions. I noted the recommendation that labeling as to noise levels might not necessarily be applicable to export shipments. For the record, do you have some information as to the percent of the total production of construction equipment—new production—that is exported?

Mr. LARMORE. It's a little hard to define, and not as a quotation from my association, but from what I would assume from my personal knowledge, that this may be in the area of 40 percent.

Dr. MEYER. I said I had two questions, but I actually have three.

There are some countries that do have more restrictive noise control requirements than the United States at the present time. The export market must then meet the requirements of Sweden or Germany or Switzerland or England. If it is going there, it will have to meet those requirements.

Mr. LARMORE. Exactly. Our concern, Dr. Meyer, is in the perhaps underdeveloped countries of the world, it would seem completely out of character for us to saddle ourselves with a market deterrent which would probably achieve very little success even if we felt

it was a great cultural responsibility of ours to not put noisy machines into some underdeveloped country of the world, as long as this would require a premium in price, it would seem that it would logically follow that somebody else in the world manufacturing community would simply supply machines at a lower price without having this restraint placed on them.

Dr. MEYER. What you are saying is, one ought to be working toward an international standard on this?

Mr. LARMORE. Exactly.

Dr. MEYER. Let me ask another question. You mentioned costs. We are vitally interested in economics in this whole business of environment.

Again, I realize you have to generalize this. In the larger types of heavy construction equipment, what is the average rate of amortization or depreciation life of these items? If there be such a thing. Rather than average, let's say typical. I think typical would be better. That would allow you to select a class or two, rather than the average.

Mr. LARMORE. It's a little like the automotive. You go through three or four generations of owners. But let's talk about the first buyer. And this is a complete generalization, and depending upon some of the tax breaks that may be in existence at the time, he might very well elect to trade those machines in for new at the end of 10,000 hours, which, typically for a large energetic contractor might be two and a half years—3 years, something of this nature. It could be more or less.

But the machines stay in existence. In other words, he can simply say, I can trade and come out better than going through a major overhaul at this period of time. The major overhaul is accomplished, and the machine stays in existence, but it's in somebody else's hands.

Dr. MEYER. I think you can see what I was driving at, if we were talking about somewhere between 3 to 25 percent increase in costs for certain decibel reductions, what would be the period of time in which that would be passed on to the purchaser of those construction services?

Mr. LARMORE. Well, we are talking about a multibillion dollar business, as you are well aware, so we don't need to go through the arithmetic.

Dr. MEYER. No, I was just trying to get a feel of whether it was 5 years or—I think one witness, a member firm of CIMA, said something about a 5-year useful life before it was in secondhand service. This was typical, so I'm sure it would range anywhere from 1 to 10.

Mr. LARMORE. That's correct.

Dr. MEYER. Thank you very much. Along with the attachments, it will be a very useful addition to our activity, and we will be talking to you further about this idea of testing items.

Mr. LARMORE. Well, we would like to repeat the fact that we are structured as an association to operate legally and constructively, and we do offer you our complete cooperation and services not necessarily in the area of human response. That is, we are mechanics, engineers—in the area of our expertise. We urge that we be given an opportunity to go full bore along with you.

Dr. MEYER. We will be talking to you further about this. Thank you very much.

We talked somewhat about equipment today. In previous hearings, and also in this hearing, there has been a fair amount of emphasis upon the fact that not only do we need to consider the alteration of things in order to control noise, but also the way we arrange and order communities and conduct activities.

And I am most pleased to have Mr. Dorn McGrath, president of the American Institute of Planners, to come forward and give us a statement on planning.

Mr. McGrath, it's nice to have you here, sir.

STATEMENT OF MR. DORN C. McGRATH, JR., AIP,
PRESIDENT, AMERICAN INSTITUTE OF PLANNERS

Mr. McGRATH. Mr. Chairman, and members of the panel. I am pleased to have the opportunity to appear in behalf of the American Institute of Planners. I am the current president of AIP. My full-time role, however, is as professor of urban planning and chairman of the Department of Urban and Regional Planning, at the George Washington University.

I happen to have had a prolonged interest in the problem of noise in the environment, particularly relating to transportation sources, and I am grateful to the panel for the opportunity to appear on behalf of the institute on this occasion.

With your permission, I would like to not read in detail the statement that I have left with you, but rather touch upon certain salient points and illustrate other points, and some of those within the testimony, by virtue of other comments and the slide materials that I have brought with me.

Dr. MEYER. Very Well, sir, your prepared statement will appear in the transcript to go to the Congress following your verbatim statements.

Mr. McGRATH. Thank you.

My principal concern today is to make it clear that comprehensive planning agencies, in their land-use planning role, can be principal forces in the process of noise abatement and control in the environment.

As the Chairman has suggested, and as other witnesses earlier today have suggested, the arrangement of establishments (land uses) in the metropolitan areas, particularly, of the United States, has a great deal to do with the quality of the environment that people perceive.

In the last analysis, the insulating effect of sheer distance from sources of noise is perhaps the most reliable protection for the majority of people against the intrusion of noises from sources they cannot control.

The key to providing these insulating benefits, of course, lies in planning in advance for the arrangement of compatible land uses in relation to one another. Obviously, it's not possible always to arrange land uses, in built-up areas particularly, so that the appropriate separation occurs to take advantage of the attenuating effect of distance on noise signals.

In some such cases, the compromises that can be achieved through acoustical treatment of buildings may be helpful, but this is a remedial device that has proven particularly unpopular and ineffective as applied to residential construction in most urban areas.

As a consequence, I am more interested in suggesting that there are possibilities for preventive action that are much less developed than the illusory possibilities for remedial action through noise insulation.

I want to mention also the fact that as a professional society, our concern with the noise from fixed sources is considerably less than our concern about noise from sources that move, particularly in interstate commerce.

Noise from jet aircraft and noise from highways is indeed beyond the reach of most local agencies and municipalities to control, and as a consequence, it presents a greater environmental problem than perhaps the noise from fixed sources.

While we do not wish to deny the problems resulting from the accumulated effects of noise from fixed sources, there is certainly sufficient authority in the police power in most municipalities and States to control, through zoning or special ordinances, such noises once the community perceives the need to do so.

In effect, where there is a will to control noise from fixed sources, there is certainly a way.

The process of comprehensive planning is increasingly comprehensive, and it is beginning to deal directly with some of the factors that introduce noise in the environment in unacceptable terms. Nevertheless, in the history of the evolution of comprehensive planning, there have been four factors which I wanted to emphasize, that have created far greater momentum for the generation and accumulation of noise in the environment than the momentum of land use planning or comprehensive planning, as generally known.

These four factors are, first, the advance of aviation technology during the 1960's. Jet aircraft were introduced into commercial service initially in 1959, and the aircraft were introduced into airports entirely too small to contain the noise. And as a result, the noise zones near most of the major airports are much larger—sometimes three or four times greater—in acreage than the airports themselves.

In addition, the second factor is the ignorance of the psychological and physiological effects of continued exposure to transportation noise on people. This ignorance and confusion—the mythology of noise exposure, if you will—has hindered the application of appropriate preventive measures through the police power which depends on defining restrictive measures in terms of public health, safety, and welfare.

It was extremely interesting to hear this morning the representative of the senior citizens of the United States appeal to this particular problem, because there is evidence that is now accumulated which hopefully we can see translated into prescriptive planning to prevent the interference with sleep, which noise, as a factor in the environment, imposes on elderly persons and very young children as well.

A third factor is sheer political expediency, and this is related to some degree to the ignorance of potential effects of noise exposure that results from a short-term gain or decision made without regard to the cost of long term environmental degradation in the environment.

Fourth, there is no concept of limits on the growth of noise exposure zones associated with airports. These are dynamic zones. They do expand and concurrently there is no concept of a limit on the degree to which growth in the vicinity of airports ought to be curtailed.

As a result, the noise exposure zones are growing outward from the airports, and encroachment by the community on the area affected most severely by the airports, progresses at a very surprising rate in many areas.

This, in effect, accounts for the collision course between a great many airports and the communities they purport to serve.

The combination of these factors throughout the country has resulted in restrictions on airport operations, litigation against airports, and the Federal and local governments that operate them, to recover losses in value, and has resulted also in extreme actions such as the clearance of land already developed in the vicinity of many major airports in order to forestall or avoid litigation, and to provide compatible land usage. This is an extremely expensive procedure.

It has also resulted in grievous interference with activities of people—sleep, education, religious services, recreation—in the vicinity of airports.

To a somewhat lesser degree, largely a lesser degree defined by smaller dimensions, these same phenomena apply in the immediate vicinities of noisy expressways.

I would like to illustrate for you graphically the extent of some of these problems, and also the comprehensive planning approach to dealing with these problems, if you will permit me to focus the projector.

Dr. MEYER. Yes, sir. (Slide.)

Mr. McGRATH. This first slide characterizes for agencies concerned with comprehensive planning part of the problem, and it is the approach to aviation from a distance, and it is a problem we share in this room today, inasmuch as we are not exposed ourselves to the effects of aircraft noise from a dramatic machine of this kind, and as a consequence, the few hundred thousand people in this country who actually live with this problem, don't have the same means of communicating to those of us who don't live with it every day year round, and as a consequence, the public reaction has been delayed in peaking after the introduction of jet service.

The silent image of an aircraft is, I suggest, a very deceptive concept, and I think we should emphasize that, short of introducing 120-decibel signal in the room. (Slide.)

This slide shows the typical pattern of development in the vicinity of an airport without the benefits of any particular comprehensive planning relating to aircraft noise. In this case, the center of the screen shows the airport at Atlanta, and the yellow-

ish areas reflect residential development and the runways are clearly indicated. Open space is indicated in white.

And this reflects penetration of the airport into residential areas, or, if your point of view is otherwise, encroachment of the residential areas on the airport. It results in a total stalemate in terms of airport development, and in terms of achieving residential amenities. (Slide.)

This is how the process might work, very simply described, but illustrated in the case of Detroit, Wayne County, Airport. This is not as impacted an area. Obviously, the white areas around the airport boundaries reflect open land, often for agricultural use, and the yellow is residential use. So there are opportunities for both preventive action to forestall growth of incompatible use nearby, and less need for remedial action to clear incompatible uses to achieve harmony with airport operations. (Slide.)

The key to adopting such a procedure lies in defining the zones of noise exposure. These are defined by a technique used as early as 1966, to be precise, and so this is not the newest of concepts. It does reflect the more intense noise zones closer to the airport, and it was a beginning in the development of noise exposure controls related to land use planning. (Slide.)

Idealized, the land use plan suggests that less dense development and more open space uses should be allowed to accumulate close to those zones of high noise exposure, and residential development at a greater distance.

Land uses should be compatible, such as industrial uses shown here.

So there is a way of projecting the effects of an airport on surroundings and then achieving control of land usage as a matter of public policy through zoning and through other controls. I must emphasize this fact, however, that without political commitment and understanding of the consequences of *not* taking such actions, there is very little point in proposing them for purely altruistic purposes. (Slide.)

This also reflects the problem as seen by comprehensive planning agencies throughout the country, in viewing an airport in its somewhat thinly-disguised state.

This represents Los Angeles International Airport, 3,000 acres, and neatly surrounded by the community, largely shown in this red pattern.

This is a very deceptive way of looking at anything about an airport. (Slide.)

I would submit this is a much more realistic assessment of the airport's effect on the environment. The lines you see reflect the noise exposure contours, in this case contours of NEF 80, a value I won't dwell upon in view of the fact that members of the panel are partly responsible for the invention of the concept.

Nonetheless, it's a rational method of defining and projecting areas within which noise exposure can be expected to be a severe community problem.

The important point here is that the red line represents 1965, and the darker line farther out represents 1975, and this shows in this case the dynamism of growth of the airport noise exposure problem under intensified use of the airport itself.

The zones grow even though the land use pattern may remain stable, and unfortunately the land use pattern often does not remain stable, out of ignorance of the existence of such zones of exposure. (Slide.)

This is one of the costs of ignoring the noise factor within those contours. 1965-1975—you can see the large numbers of people exposed and there is ample evidence of litigation and community protest to reflect these problems.

I have to point out the fact that the figure of 58 schools is no longer accurate, inasmuch as two new schools in the immediate environs of this airport have been abandoned as a consequence of noise exposure and there is litigation now in the county of Los Angeles between the school authorities and the airport department which will attempt to allocate the economic cost of that unfortunate decision. (Slide.)

This is very quickly an attempt to indicate what the NEF means. Again, I will not dwell on it, but it does describe the rational method of integrating over a period of time the frequency of occurrence, the time of day in which it occurs, location of the aircraft, laterally and vertically, above the signal, yielding a value which is plotted to give the noise exposure. (Slide.)

Another example which will illustrate many of the problems and some of the economics involved in the noise exposure pollution problem from a planning point of view, is centered on Jamaica Bay and Nassau County, near the city of New York.

J. F. Kennedy Airport, which appears at the right of the screen, is an area of 5,000 acres, and a runway extends partly into the area of Jamaica Bay.

This is primarily to orient those who are not familiar with the local scene. (Slide.)

This will show several of the problems. First of all, the airport itself, major runways for jet use, the fragmentation into Brooklyn, Borough of Queens, and town of Hempstead.

Five counties, two boroughs of the city of New York, and a number of smaller jurisdictions, some of whom you have heard from through their representatives in connection with problems generated by this source of transportation noise. (Slide.)

In this case, there are many types of pollution that are associated with aviation operations in a crowded site, and some of them are shown here in terms of air pollution and petroleum pollution of the bay. These affect generally the areas fairly close to the expressways, and while not precisely in scale, and not accounting for wind drift, these reflect the approximate magnitude of pollution problems on a windless day in relation to expressways and also the interface between polluted or badly polluted and less polluted water of the bay. (Slide.)

This suggests, however, by contrast, the magnitude of the noise exposure problem.

This pattern of light orange represents the contour of 30 NEF, corresponding to that which you saw for Los Angeles. The interior represents 40 NEF: in effect, an area which under current standards of environmental understanding would never be outside the airport boundary. Unfortunately, the noise patterns

have long since far outgrown the boundaries of Kennedy Airport. (Slide.)

Some of the problems of not dealing with this factor in planning for the location of critical public facilities are apparent on this slide.

The dots that you see are symbols indicating locations of health care facilities. Occasionally remarkable aberrations occur, as in the case of a decision by the State of New York to locate a school for retarded children in this particular location [indicating] without any particular consideration given to noise insulation of the buildings, and a mental health clinic at the opposite end of the same pattern.

These are proposed facilities, so there is still an opportunity to change some of those. Unfortunately, all of the others represent noise-sensitive facilities already built in very noisy areas. (Slide.)

This represents a more aggravated problem with schools. In some of the schools, the phenomenon known as "jet-pause teaching" consumes so much time in the day that, in the aggregate, 5 minutes are lost in a typical class period during the hour or 2-hour cycles of planes approaching the airport, particularly on this axis, and this adds up to about 1 day out of 15 completely lost from the students' educational program.

This problem is acute in this area, and has other ramifications which are important in school facilities planning, because it is very difficult to recruit and retain teachers in such situations. (Slide.)

Perhaps more tragic is the pattern shown in this slide. This one shows the location of publicly assisted housing in the environs of Kennedy Airport. Regrettably, all of this housing has been built since 1959, the advent of jet traffic in commercial flight.

building codes and land use plans and zoning to prevent the construction of incompatible land uses within the noise exposure areas of this airport.

Now you might feel that it is not necessary to do that when you start out with an airport of 16,000 some acres, nearly twice the size of Dulles Airport, by comparison, as a means of insulating aviation noise from the sensitive community.

Nevertheless, it may be possible to acquire all the land one would need to surround the contour of 30 NEF. They have in this case acquired most of the area within 30 NEF, and all of the 40 NEF exposed area. That shows up in this representation (slide)—the zone 3 corresponds to 40 NEF, and should be entirely within the airport boundary, and for all intents and purposes is.

The zone 2 is much less exposure but still exposure sufficient to pose serious problems to residential use and it is in this area that communities begin to assume responsibility for environmental quality control in this area.

It is important to note, although it is not in my prepared testimony, that in the northern vicinity of the airport, in the community of Flower Mound, a new community is being built under the new community program sponsored by HUD.

And this represents one of the most significant examples of preventive land use planning that I think we can point to, and it

is interesting that it occurs in the north-central Texas region, but in this particular case, within the zone where the 2 is in the slide, the formal agreement between the United States of America and the Flower Mound New Town Limited, the developer of the project, it is stipulated that for 12 years, there will be no residential development whatever in this zone. This does not provide for a total taking of the property. It certainly defers its development until perhaps the technology of noise abatement at the source—the engine—can catch up with the problem, and perhaps release that land for unrestricted development.

In the meantime, configuration of the new community site is such that the developers can continue with earlier phases north and west, without changing plans.

But it's a significant example of using the foreknowledge of noise exposure in the actual urban planning process. (Slide.)

This, of course, is somewhat overstated esthetically, perhaps, but it does reflect the ideal environs of an airport which Dallas-Forth Worth is seeking. (Slide.)

The problem is one of encroachment elsewhere in the United States, and this example shows, in the purple tint, the degree of encroachment. The difference between land use in 1954 is shown by the small pink area in the right, and in 1968 is shown by the purple.

This is development of land mostly for residential uses encroaching on Baltimore's airport. (Slide.)

This is a much more acute problem of Lambert Field in St. Louis. Again a comparison with 1963—slight pink—and 1968—purple.

This airport is badly surrounded, and this is one of the reasons why the region is looking for another airport, perhaps in Illinois. (Slide.)

Another example is West Palm Beach. Again, the airport is surrounded for all intents and purposes, limited in the degree to which it can ever expand, and limited in the degree it can operate certainly, in an area well known for its retirement community, and one of the sources of objection to this kind of environmental problem. (Slide.)

Finally, in Phoenix, the same problem, development of original Phoenix in 1956, compared with 1968, with the runway extension into the river. Actually, properties in the western sector of the airport had to be acquired, taken out of residential use, in order to alleviate noise exposure problems.

Similar difficulties have afflicted the city of Dallas, of course, and Los Angeles, to the tune of several millions of dollars for very little return in compatible land usage. (Slide.)

This, then, is the level of exposure we seek, through the process of comprehensive planning, to prevent—the incompatible land use of a motel immediately adjacent to an airport, directly in the flight pattern of power aircraft. And this is the illustration of the range of the problem which planning agencies throughout the United States are concerned with.

I would like to conclude my remarks by suggesting that there are ways in which these kinds of problems can be addressed very specifically through comprehensive planning process.

The testimony suggests some of the places in which the prob-

lem has to be looked at first, in order to achieve an appropriate strategy for preventive, and in some cases very radical remedial action, or face the prospect of abandoning certain airports.

But there are other excellent examples of smaller cities reacting to this problem, planning in advance constructively, and one of the examples which I referred to in my testimony concerned Onondaga County in New York, and the community of Salina has been analyzed in a new publication of the American Institute of Planners, which I would like to make available to the panel when it is received from the printer in a week or so, because I think it is instructive as to the background and application of this procedure.

Dr. MEYER. We'd like very much to have that included with the transcript if at all possible.*

(Committee insert:)

Mr. MCGRATH. Thank you, sir.

The principal opportunity, or one of the principal opportunities that I foresee for planning agencies to play a role in noise abatement in the environment lies in the project notification and review system which has been established pursuant to the provisions of the Demonstration Cities and Metropolitan Development Act of 1966, and formalized and expanded in the Intergovernmental Cooperation Act of 1968.

The implementing provisions for the latter act are contained in Bureau of the Budget Circular A-95. This provides for project review by an areawide agency, project review to assess consequences in advance of actual construction.

In effect, this is a very early warning system which would complement the provisions of section 102(c), obviously, of the NEPA.

And it does give anywhere from several months to one or two years advance opportunity to begin to consider the potential effects of public construction on the noise environment, through the regional planning process.

This process, however, has some risks, and perhaps the greatest risks are in its being transformed into a purely mechanical review without substantive consideration of the environmental effects of the projects involved.

It's easy to look for noise exposure in connection with an airport or a railroad marshalling yard, or an expressway. It does not always occur to the agencies to examine the potential exposure problem that may result when a sewer is built, because the housing that follows the sewer and waterline and the others may be approaching the noise exposure problem from the side opposite the actual noise source.

As a consequence, much of the attention of the planning agencies has to be devoted to this kind of environmental review in project when they are afforded earlier opportunity, and this requires considerable Federal leadership and advocacy to assure that that kind of review and perspective is applied to these projects, and the Federal advocacy of that particular process has left something to be desired, I think we would all have to concede, in

*"An Airport Environs Plan," *Planners Notebook*, vol. 1, No. 7, October 1971.

previous years, as evidenced in part by the construction of 31,000 dwelling units with Federal subsidy in the noise exposure areas of Kennedy Airport alone.

Well, I think these examples illustrate the points I hoped principally to make, Mr. Chairman, and I am very grateful for the opportunity to appear before your panel, and I would like to offer the services of AIP in any way we can assist your efforts in this regard. Thank you very much.

Dr. MEYER. This is a good contribution to the various proceedings we have had, because in your presentation you have provided details about a number of places that the various citizens complain about, and in only a few instances have we had such depth of pointing out the changes that have occurred over the years.

The thought occurred to me—is there a possibility we could get black and white reproductions of the slides?

Mr. McGRATH. Yes, sir, we can do that for a number of the slides.* They represent illustrations in the report of the National Academy of Sciences' study group on Jamaica Bay, of which I was a member, and I am sure we can make this available in that form.

Dr. MEYER. What I would like to do is have those appear in the transcript, since there will be fairly wide distribution of this.

Mr. McGRATH. I'd be happy to cooperate in doing so.

(The full text of Mr. McGrath's remarks follows:)

PREPARED STATEMENT OF DORN C. McGRATH, JR.,
AIP, PRESIDENT, AMERICAN INSTITUTE OF PLANNERS

Mr. Chairman, members of the committee,—I am Dorn C. McGrath, president of the American Institute of Planners. The AIP is a national professional society, devoted to the study and advancement of the art and science of city, regional, State, and Federal comprehensive planning. The principal concern of the institute is the planning of the unified development of urban communities and their environs and of States, regions, and the Nation.

The nearly 7,000 members of the institute have major responsibilities in government and the private industry as consultants in the development of program, policies and projects plans to guide processes of urban growth and change throughout the United States. The work of professional planners is directly concerned with the quality of the Nation's urban environment. Many planners are responsible for translating legislative goals concerning environmental quality into specific project development decisions

*The illustrations which Mr. McGrath refers to are as follows:

Figure 302, p. 99—Construction of the noise-exposure forecast. National Academy of Sciences/National Academy of Engineering, Jamaica Bay and Kennedy Airport: A Multidisciplinary Environmental Study, Volume II, January 1971.

Page 244, "Journal of the American Institute of Planners," XXXVII, No. 4 Figure 2, Location Map: Jamaica Bay and Kennedy Airport.

Figure 3-1, Jamaica Bay and Kennedy Airport environs. National Academy of Sciences/National Academy of Engineering, Jamaica Bay and Kennedy Airport: A Multidisciplinary Environmental Study, Volume II, January 1971.

Figure 3-2, Air and water pollution sources in Jamaica Bay and environs. National Academy of Sciences/National Academy of Engineering, Jamaica Bay and Kennedy Airport: A Multidisciplinary Environmental Study, Volume II, January 1971.

Figure 3-3, Areas currently exposed to NEF 30 and 40. National Academy of Sciences/National Academy of Engineering, Jamaica Bay and Kennedy Airport: A Multidisciplinary Environmental Study, Volume II, January 1971.

Figure 3-4, Public schools in high-noise areas of Kennedy Airport environs. National Academy of Sciences/National Academy of Engineering, Jamaica Bay and Kennedy Airport: A Multidisciplinary Environmental Study, Volume II, January 1971.

Figure 3-5, Hospitals and health care facilities in high-noise areas of Kennedy Airport environs. National Academy of Sciences/National Academy of Engineering, Jamaica Bay and Kennedy Airport: A Multidisciplinary Environmental Study, Volume II, January 1971.

Figure 3-6, Publicly assisted housing in high-noise areas of Kennedy Airport environs (projects built and occupied since 1959, currently in planning or under construction). National Academy of Sciences/National Academy of Engineering, Jamaica Bay and Kennedy Airport: A Multidisciplinary Environmental Study, Volume II, January 1971.

exercised through the governmental institutions of land use planning and regulation. In addition, many professional planners are involved in the process of transportation system planning and in the formulation of performance standards and environmental protection criteria which such systems increasingly require.

On behalf of the members of the institute, I want to thank the Office of Noise Abatement and Control for the opportunity to appear and present our views on the issues and problems which EPA must face in fulfilling its obligations pursuant to the Noise Pollution and Abatement Act of 1970.

My remarks today will be directed principally to the central theme of national programs affecting environmental noise control as they may be applied in both preventive and remedial actions to deal with problems of environmental noise exposure through the comprehensive planning process. I would like to emphasize applications of urban planning techniques and programs for the alleviation of environmental noise associated with transportation sources and particularly those associated with highways and airports. Noise from the myriad fixed sources that comprise metropolitan areas represents a collective problem of rising ambient noise levels in cities; however, there is sufficient authority under the police power to control the great majority of these sources through zoning and ad hoc noise ordinances once the problem is perceived in its true perspective by units of local government.

LAND USE PLANNING AND NOISE ABATEMENT

Land use planning can be a principal tool of environmental noise abatement and control. The insulating effect of sheer distance from sources of high noise output is the most reliable protection for the majority of people in urban areas against the intrusion of noise from powerful sources such as jet aircraft and vehicles moving at high speeds on expressways.

The key to providing the insulating benefits of distance lies in a planning process that comprehends the projected effects and areal extent of noise from these major modes of transportation and which provides accordingly for the separation of land uses sensitive to noise from such facilities as airports, expressways, and truck terminals. Obviously, it is not always possible to provide the protection of sheer distance against environmental noise from aviation or highway transport sources, and compromises must be made which bring noise sensitive land uses and noise generators too close together. Under such circumstances, acoustical treatment of structures may afford a measure of relief. Prescribing needed acoustical treatment for housing and schools is not within the authority of most comprehensive planning agencies, but the advisability, or, as in the case of schools, churches, and other facilities where freedom from noise intrusion has premium value, the necessity for such treatment is well understood by most planning agencies. Unfortunately, there is a substantial gap between the recommendations of planning agencies for either land use planning or acoustical treatment of established facilities and the implementation of such recommendations through the normal political process. The result of this failure in the translation of planning recommendations into public policy in the form of zoning or building code requirements through the local legislative process is serious environmental degradation near many metropolitan airports and expressways.

Four factors have hindered the realization of the potential benefits of land use planning as a primary tool for preventing the emergence and aggravation of noise exposure problems:

(1) The rapid advance of aviation technology during the 1960's, with the introduction and widespread use of jet aircraft at airports never designed to provide the benefits of sheer distance from neighboring land use as a safeguard against noise exposure; as a result the zones of severe noise exposure near most major U.S. airports are typically three to four times greater in acreage than the airports themselves.

(2) Ignorance of the psychological and physiological effects of continued exposure to transportation noise in the environment has retarded the development of land use restrictions against noise exposure as a matter of public health, safety and welfare.

(3) Political expediency in approving requests for intensified land usage in the noise exposure zones of airports in pursuit of short-term revenue gains without regard for the costs of long-term environmental deterioration.

(4) The absence of any concept of reciprocal limits on the growth of the

noise exposure zones associated with airports and the patterns of growth of land uses incompatible with aircraft noise; as a result, the zones of severe noise exposure around most major airports continue to expand as a function of increasing air traffic (primarily jet aircraft), and at the same time community growth (primarily residential), intensifies in the areas subject to noise exposure.

The combination of these factors throughout the country has resulted in costly restrictions on airport operations, extensive litigation against airports to recover the losses of property value attributable to noise exposure, and substantial interference with many essential activities of people who happen to live near airports. In a somewhat lesser degree, the same problems have arisen in the vicinity of urban expressways, even though the levels of noise produced by automotive traffic are not as punishing as those produced by airport operations.

The slow growth of comprehensive land use planning, even where assisted by Federal grant-in-aid programs, has imposed costly penalties on the Nation's metropolitan areas. In most such areas, critical gaps in the comprehensive planning process have aggravated the problem of developing compatible land use patterns which would minimize or eliminate environmental noise exposure problems.

Planning for individual airports, which airport operators usually do, and planning for the development of surrounding communities, which is always done by others, both require open and direct consideration of aircraft noise as a potential environmental problem. Unfortunately, in most areas, neither planning for airports nor planning for nearby communities reflects adequate recognition of the noise factor. Absent adequate planning—which would include projection and evaluation of noise effects before airport construction or intensification of airport use—even the most enlightened public policymaking process in pursuit of compatible land usage, airport expansion, or overall environmental quality goals, is rendered ineffective. There is, however, little evidence to suggest that realistic estimates of aircraft noise projected beyond airport boundaries affected either public policy for metropolitan land use or airport expansion plans until the jet age was well advanced.

The evidence in fact suggests the opposite. The majority of the airports comprising the country's most popular major hubs are almost hopelessly hemmed in by communities to whom the airports pose a serious environmental threat. A study of 21 large hubs conducted by the Department of Housing and Urban Development in 1967 revealed that of the 36 air carrier airports within the hubs, 12 are almost completely surrounded by intensive development and 16 other are at least 50 percent encircled. The plight of these airports is underscored by the fact that half of the 36 are located within 10 miles of the central business districts of the major cities they serve; this means that while they enjoy special advantages of intown accessibility, they also suffer from having higher land values as a constraint to expansion. Moreover, by 1980, an increase of 143 percent in scheduled air carrier operations is expected for all of the 21 large hubs studied. There is a strong correlation between increased air traffic volumes and community consciousness of the airport itself, and thus, as air traffic intensifies at an encircled airport, the noose of community objections within which it must operate draws tighter every year. This fact only increases the urgency of developing other airports in all of the large hub metropolitan areas. It also dictates the need to accept the new realities of aircraft noise in locating and developing other airports of any size to create a system of interdependent facilities for aviation in each metropolitan area. Failure to accept the known realities of environmental noise impact for each new airport in a metropolitan area can only cause a proliferation of the current hard core noise problems characteristic of most of the hubs in the national system. Instead of being relieved by the establishment of alternate and reliever airports systematically related to major hubs, the current noise problems may instead simply be reproduced in suburban communities already hostile to airport environmental impact.

Major problems of environmental pollution by aircraft noise are now in clear prospect in the suburban areas surrounding airports serving Atlanta, St. Louis, Phoenix, Chicago, and San Francisco, to name but a few. In some localities, such as West Palm Beach and St. Louis, there is evidence that more land has been developed for suburban residential use in noisy

locations since 1950 than the acreage occupied by the principal airports serving those cities. By ignoring both the noise-control potential areas, citizens in these airport-affected areas are gambling with the quality of their basic environment, not to mention their prospective investment return.

Elsewhere there are more encouraging signs that environmental considerations in airport and community development planning are being recognized and applied beneficially. Since 1967, the north-central Texas region, centered on Dallas and Fort Worth and including both cities and nearly two dozen fiercely independent separate municipalities, has been engaged in an unprecedented joint venture to plan and build the largest airport in the world. As a major departure from conventional airport planning practice, the cities of the region have faced the reality of jet noise squarely at the outset and applied their strongest natural resource—open space—to the problems that aircraft noise creates. The decision to acquire sufficient land for the airport to keep potentially incompatible adjacent development at a safe distance resulted in a basic site requirement of 29 square miles.¹ As a further departure from tradition, the regional community north-central Texas has organized a program of integrative planning functions for airport development in collaboration with those for all of the surrounding separate but interdependent communities. Through a program of information-sharing and joint participation in zoning and highway and utilities planning, the Regional Airport and its neighboring communities have been able to achieve synergistic results from their efforts.

Pressing their natural advantage of having open buildable land, the communities of the north-central Texas region have adopted and are carrying out a strategy of land use designed to hold open for future development land in several municipalities lying within a mile of the 16,500-acre new Regional Airport. Zoning to conserve such land for actual use in the 1970's will afford an even greater degree of protection against noise for both the airport and its associated communities, but will not deprive individual owners of development opportunities for appropriate land usage.

Action to capitalize on aviation growth and to preserve future options for development has not been restricted to the major cities, however. In Salina, N.Y., where the town has a long-term interest in the viability of the nearby Clarence E. Hancock Airport serving the Syracuse metropolitan area, the town board took the initiative in 1967 to adopt a comprehensive land use plan designed to maintain compatibility between town and airport in the airport environs. Acting in the interests of a metropolitan public, the town planning board and the Onondaga County Department of Planning developed the following goals in relation to the town for the airport vicinity:

"To discourage, within the airport noise zone, the construction of residential structures, etc., that cannot be sufficiently insulated against externally generated aircraft noise, at a reasonable cost;

"To recommend and adopt a comprehensive land use plan for that portion of the town of Salina within the aircraft noise zone, which would: (1) permit the owners of vacant parcels of land to develop their properties with uses that would be compatible with aircraft noise, and surrounding land uses; and (2) provide land uses and physical buffers for the protection and preservation of existing established residential neighbors; . . ."

The action of the town in adopting these goals stands as an especially significant contribution to the continuation of nuisance-free operations at the airport, particularly since more than 2,000 acres of potentially buildable land in municipality is affected by this policy decision.

On an even more precise scale of development, with profound implications for local development policy, are several recent court decisions involving airport-related zoning. In Santa Barbara County in California, rezoning designed to prevent urban sprawl and to forestall the development of a residential zone in areas susceptible to excessive noise was upheld on appeal.² In Pennsylvania, the right of a municipality to establish legislative policy for regulating development potentially inimical to the utility of an airport was upheld—the court affirmed the right of the township to prohibit residential dwelling units in industrial as well as airport districts even though

¹ "Airport Master Plan," prepared for the cities of Dallas and Fort Worth, Tex., by Tippetts-Abbott-McCarthy-Stratton, Engineers and Architects, December 1967.

² *NANAC Newsletter*, vol. VII, No. 8 (1967).

³ *Smith v. County of Santa Barbara*, 243 A.C.A. 126, 52 Cal. reporter 292, Dist. Ct. App. 2d Dist. 1966.

the result was that residents' uses were excluded from 85 percent of the township's 30 square miles.¹ Such definitive actions, while hardly typical of local urban development policy of the 1960's, must be recognized as essential to the realization of the potential benefits of the rapidly rising national trends in aviation growth and productivity.

Mechanisms are now available in most metropolitan areas to bring the present and future problems of environmental noise from aircraft into public perspective and to encourage the use of preventive measures. Congressional concern about trends in development problems in metropolitan areas resulted in the enactment in 1966 of legislation requiring referral of grant applications for a wide range of public facilities to a metropolitan agency for planning review and comment prior to funding.² This was done to insure that maximum benefits, including the implementation of areawide plans for development, might be achieved. More than 200 metropolitan areas across the United States now have such referral agencies. Proposals for major public facility construction, including airports, highways, water and sewer facilities, open-space land acquisition and conservation area development, are affected by this metropolitan referral and review requirement. As a result, it is possible to bring to bear the perspective of an official areawide agency and to give consideration to problems and development proposals that may have both broad and specific implications for land use, environmental quality, and development policy. In addition, the Bureau of the Budget initiated a system of project referral and review at the State, regional, and metropolitan levels.³ The system is designed to marshal informational resources and promote coordination among development planning agencies throughout the country.

The project notification and review system created by this executive action provides a vehicle for making advance evaluative judgments on over 100 different types of projects having potential to affect the quality of both social and physical environments in urban and rural areas, including the troublesome suburban fringe. The mere existence of this administrative machinery provides no automatic assurance that it will be used effectively. It remains for the localities to put these metropolitan referral and review systems to work to enlarge public understanding of specific functional and environmental problems of urban areas and to implement local and areawide land development policy. The support of the Environmental Protection Agency can be an important incentive to these areawide planning agencies and localities to apply noise abatement criteria in their project review and comprehensive planning activities.

The pollution of the metropolitan environment by aircraft noise is an emergent problem for most major cities, and in this fact lie both challenges and opportunities for comprehensive land use planning to make a significant contribution to the Nation's evolving air transportation systems. Having ignored the realities of noise exposure in transportation planning for many years, the Federal Government and local agencies are now faced with needs to provide remedies for several hundred thousand urban dwellers whose homes are no longer satisfactory havens of peace and quiet. Moreover, many localities are enjoying a completely false sense of security about what their present zoning and building regulations can do to protect their homes and schools from noise and thus prevent their coming into conflict with their own airports.

Comprehensive land use planning, if carried on at the appropriate metropolitan scale, affords a means of dealing with these growing problems of urban environmental noise.

The growing fund of experience with airport noise problems should make it clear that new community development, especially for housing and schools, in areas of projected noise exposure should be deferred until current research on engines gives real promise of quieter planes. It is always easier to rezone to increase population density, and to build schools, hospitals, and houses after the noise climate has been tested, than to remove people who object to noise, to pay them for damages, or to insulate their homes to remedy a foreseeable problem.

In previous years, effective land use planning to prevent serious noise

¹ *Township of Hickory v. Chadderton*, Pa. Court of Common Pleas, Mercer Co., May 31, 1967.

² Section 204, Demonstration Cities and Metropolitan Development Act of 1966, Public Law 89-754.

³ Bureau of Budget Circular A-95, July 24, 1969, p. 29.

exposure problems in communities near airports has been handicapped by official reluctance to admit the disparity between airport acreage and the noise zones that planes project, by a lack of knowledge of the noise levels generated by different types of aircraft and the noise distribution patterns associated with varying airport operations, and by a tendency to gamble on the nature of community response to be expected under several degrees of noise exposure. Information on all of these factors is available now, however, as is a rational method for predicting aircraft noise as a function of future airport operations. Federal leadership to apply this information is needed.

Mr. Chairman, I appreciate this opportunity to appear before your panel in behalf of the American Institute of Planners. We would be pleased to provide your Agency any additional information or assistance that you might require to develop and apply the process and institutions of comprehensive planning to the abatement of environmental noise pollution.

Dr. MEYER. I'd like to ask Mr. Wise if he would like to start the questioning.

Mr. WISE. First of all, I might add a few things about your observations that might be pertinent here regarding the Dallas-Fort Worth Airport.

There is one point that I think is very important. There are tremendous plans for foliage in the highway to the terminal area, that will provide park and green space in an amount far greater than any project I have ever seen before, and this is right along the ecological lines we are interested in, both as concerns the oxygen content of the greenery, and for absorbing the noise, and other advantages obviously.

So I think that is a tremendous facet of planning. I think it should be pointed out that all those small communities around there—Flower Mound, and Irving, and Dallas, of course, and Fort Worth, are going to have and will have, in any undertaking that is this great, a tax problem in several different ways.

One, you are taking property from a community that could possibly be used to improve their tax base, and also, you are going to have to give some tax moneys back to these communities some way, and this presents real jurisdictional problems, as I am sure you are well aware.

I think we are going to iron it out. There is a spirit of co-operation—you are aware of that—that will be worked out, but it increases the importance of a mutual understanding and mutual sympathy, or empathy is maybe a better word for what the airport is going to bring in terms of jobs, industry, et cetera. The other advantages of life for those communities.

I think it's very interesting, that Flower Mound concept to which you refer, which is one of the new cities being planned in the Nation. It's being developed by a man who is himself an environmentalist, and so I don't know whether other developers of such projects as this would be as aware of environmental problems as this person is. He is, and we are fortunate in that respect.

I would like to see if that would happen anywhere else in the Nation where a project that immense would come up.

And I am not this much of an expert in this area, frankly, but some people are saying this is the last opportunity that Dallas-Fort Worth Regional Airport will have to be able to afford that much land, that much land necessary for that immense an airport that close to metropolitan areas such as Dallas-Fort Worth.

In other words, first of all you have to have that much metropolitan area nearby, or it won't support the airport. The second thing is, you have to have enough open space that the communities can afford to purchase that property from private individuals who had previously owned it.

So some aeronautical experts—and I am not one—are saying this may be the last opportunity for that tremendous a project. And of course one of the things that makes it big in terms of acreage is the fact that we are leaving that noise area to which you refer.

Those are just a few observations, since you brought it up.

Dr. MEYER. That last one is very important because particularly in the eastern section of the United States, if one flies over at night and looks at the lights, it becomes very difficult to find any open space patterns of blackness down below. So that highlights the need for regional planning and integration of transportation systems.

Mr. BERLAND. I wonder if you think that the enforcement of public hearings would make municipalities listen to planners? I sort of felt that you implied this. Do you think so?

Mr. McGRATH. Yes, I do think that would help a great deal.

I might say there is an aspect of that problem, however, which should be of central concern, I submit, to the Agency and to the panel. And that is the fact that there is considerable reluctance, if not to say great reluctance, in some sectors of the aviation industry about making available in public forum some of the information that you have seen on these slides. And for some fairly understandable reasons. Namely, that the publication of the evidence of adverse noise exposure in the opinion of many airport attorneys constitutes high vulnerability to litigation against the airport, and some judgments have gone against airports, and as a result, there is a great reluctance to reveal this information except under some duress.

Unfortunately, if the information is not available to the public, there is really no pressure brought to bear to implement the plans that the planners have known about for a long time. I'm afraid it's a case of not having your cake and eating it at the same time.

Mr. BERLAND. Would it also be helpful to indicate on all plots of land what either approaches or contemplated approaches of takeoff patterns are?

We have that with the highways, but there is nothing about overhead. If I bought a piece of property, it would be helpful if it were mandatory to know that I am under an approach.

Mr. McGRATH. I think that's a very pertinent suggestion, and particularly in view of the fact that if you are in a noise-exposed area, 2 or 3 miles from an airport, there is nothing the local zoning can do about it whatever. There is nothing in the local land development control process to warn you unless you look over the local plan.

And I think it's not well-known practice of the real estate industry to make known these exposures situations even when they know, which is not very often.

Dr. MEYER. I was going to make a comment—if I might, Ted. Some questions were directed at several representatives of the

real estate industry in Chicago as to whether they felt any obligation at all to advise people about this.

We got a rather mixed response, particularly in Park Ridge, where they are concerned about O'Hare noise. And they indicated, yes, they did try to tell people about the problem. Some others indicated they wouldn't give the information unless you asked. They didn't feel any real obligation because it wasn't in their code.

Mr. BERLAND. Does the land around airports that is in a high noise exposure area have to be vacant, or wooded as Mr. Wise suggests? Could it not be an area of heavy industry, so in effect you can concentrate your noisemakers in one locale?

Mr. MCGRATH. Well, it could, and that is the whole principle of the initial set of slides on Detroit that I tried to illustrate.

Unfortunately, the acreages involved in noise exposure around the existing airports are so vast that they far transcend what the market for industry can absorb in any reasonable period of time in any metropolitan area. And there is a real dilemma here, because most of the very large airports need revenue, they seek means of generating revenue through the use of their vacant land for compatible land usage, but as Mr. Wise pointed out, many of the surrounding communities need the same industry.

Unfortunately, there just isn't enough industry to go around in those locations to fill up the noisy areas, even if you were to start with a clean slate, which you are not, unfortunately, doing in about 80 percent of the major airport areas in the country.

So it's a long term process of conversion of land use and not one to be counted upon for achieving quick relief.

Mr. BERLAND. But it could be a trend. It could solve one problem, as the mayor suggested—taxes—in solving the other problem of environment.

Mr. MCGRATH. Yes indeed, and some regions such as north-central Texas have a much better chance of capitalizing on that opportunity than most of the cities of the east coast.

Mr. ELDRED. I thought that was an excellent presentation on an extremely important side of the airport problem.

Mr. MCGRATH. Thank you.

Mr. ELDRED. It seems to me you said that plane noise totals have been available in some form since early 1960's, and there was no problem on upward limits.

The Federal Government now has set that, so the planner now knows the maximum he is concerned with in the future. But it seems to me we have an air transportation system which is national, and does something about source standards with maximum technology.

And the other equally important side of that is to exercise these planning tools, and they unfortunately are at a local level, and you have this extreme variance in response from the excellent example of cooperation in Dallas to the 31,000 public housing units in Jamaica Bay.

My question really is, do you—and perhaps the Mayor would like to comment on this—is there a procedure to cut through the problem such that the national problem can be assured to being solved using the planning processes that do exist to prevent this kind of encroachment in the future, or is this just going to be a

spotty thing—you are lucky some places because the people are motivated or the local political situation allows a solution, whereas other places you just fail and don't have a solution, and eventually the whole thing goes to litigation.

Mr. McGRATH. I think there is definitely a way to do this, and accomplish the objectives you are mentioning. First of all, the example of my testimony, of Salina, New York, is one good example of how they have, through the process of local negotiation, accomplished what is being accomplished in the Dallas-Fort Worth region.

To take another tack, however, to surround the problem with appropriate scale of legislative authority, is the example followed in Minneapolis-St. Paul, in which the regional planning agency—the areawide agency, has the authority to zone land on the grounds of both noise exposure and prevention of height hazards within a specified radius of the boundaries of a new airport.

And that means they have control of 2 or 3 miles beyond the boundaries of the airport over land usage.

This I think is a real breakthrough in understanding the need for positive control of the problem, and injecting environmental considerations such as noise directly into the police power. Unfortunately, one of the few shortcomings perhaps of the Dallas-Fort Worth example is that the regional airport board in that area has authority over the development of land over a comparable radius, but only in terms of protecting the air space against flight hazards. They don't have that same authority to apply to prevent noise exposure problems.

So once again, you fall back on the collaborative efforts and local efforts of the municipalities to carry out the task and there are very few places in the United States where the Minneapolis-type of authority is available. Several States are examining this, and I would hope that the next wave of enabling legislation from the State legislatures will provide authority to inject noise as a factor in public health, safety and welfare protection to enable agencies with appropriate jurisdictions to apply that form of control.

Mr. WISE. May I speak to that? I think there are several other aspects of that regarding the Dallas-Fort Worth situation that should be pointed out. Number one, I believe the information that went out to the entire community was a very good job indeed, and I had nothing to do with it, unfortunately. That was back in 1965, before my political days began.

But I do believe the people were well informed. It was explained that this would mean to both the small communities and Dallas and Fort Worth in terms of jobs, number one, in my opinion, because you are talking about taking minorities—which is a political problem and a human problem for us all—off of the welfare rolls and putting them on the tax rolls. So it appeals to the conservative, and it appeals to the liberal, or any shading inbetween. That's number one.

I think the council of governments is a very vital organization, a representative of which we heard from yesterday, and they already had an organization which taught in terms of helping each other out usually.

And I might point two things out. Number one, this isn't entirely a benevolent gesture on the part of the communities back and forth to each other, although I believe there is a spirit of cooperation. They also see in the Dallas-Fort Worth area tremendous gains in terms of industry and jobs and so forth and so on.

Put that along with the consideration that is being given for the ecology, and you have, I think, a pretty good combination.

Dr. MEYER. Dr. Johnson?

Dr. JOHNSON. I was wondering if your institute has carried out studies—and if not, do you plan to carry out studies—further on the means of implementation of land use? Particularly the financial aspects.

Mr. MCGRATH. The institute as such has not carried out any direct studies of this nature. We have, however, members who are responsible for such studies in many areas of the country. By and large, planning agencies have been responsible for the development of what are called metropolitan airport, or aircraft noise abatement policy studies, carried on by the Department of HUD, during the past 4 years.

The most recent of those just published concerns the O'Hare Airport environs; the first one—which appeared only earlier this year—dealt with the environs of Kennedy Airport, and there are several more now available and more in process.

These studies dealt with the question of achieving compatible land usage and sustaining airport operations for the economics effects that any kind of restriction might impose.

Dr. JOHNSON. Are they hunting for a common denominator, a common method of handling this problem or are they treating each differently?

Mr. MCGRATH. There are common aspects of the problem throughout the country, but by and large the complexity of the development in the vicinity of an airport and the configuration of terrain, is such in many airports that it defies a uniform solution.

There are a few techniques that will work in any airport area, such a preventive planning to avoid introducing noise sensitive uses into certain areas. This is one common denominator.

The common denominator of removing, through clearance, in-harmonious land uses is not politically viable in every area of the country. They have had to do it in Dallas to keep Love Field operating. They have had to do it at tremendous expense in Los Angeles to keep that airport open, and in a few other cases in the country that expedient as a remedial action has had to be applied.

But that simply won't achieve enough support in other parts of the country, and it doesn't yield enough results to be a method you can uniformly recommend.

Dr. DIETRICH. I'd like to shift the topic, first, more toward the preventive aspects as you have weighted your testimony, and second, away from the aircraft area, although that is a severe one and perhaps justifiably ranks first.

I am concerned that if we solve it, will we look at something else and say, Why didn't we worry about that?

You mentioned ground transportation—highways—and running through what you were saying, I detected a concern and an interest in making the impact evaluations of a federally funded project be meaningful. But I am not going to ask you about those projects which don't contain Federal funds.

As an example, I think of a shopping center. I think of this because it was just this week that it was brought to my attention for the first time that a shopping center developer was concerned about the noise impact of what he was about to do. That is not usual, I believe. [Laughter.] I commend him for his foresight, and I think it's foresight in advance of any requirement. I want to make that clear. It's not usual, because there is usually no mechanism by which this is ever called into account.

So I would like to know whether the AIP has any suggestions for EPA as to how the EPA might help in the whole country in the process of planning and consideration of things like noise impact for nonfederally funded projects.

Mr. McGRATH. I think this is an extremely important point and I believe there are very specific things that can be done, and the EPA certainly can help to see that they are done.

It's commonplace in a great many zoning ordinances to include performance standards for noise levels of industrial uses. It's not very common to include such prescriptions for commercial or residential uses. And there are indirect ways of dealing with those problems, such as passing a quiet air conditioner ordinance, therefore, dealing with some of the residential problems, but not all. The ordinance doesn't necessarily cover lawnmowers or snow blowers.

And if zoning were to undergo the very thorough nationwide revision it needs, not only to become a somewhat more flexible document or instrument, and also to include environmental considerations, this would do a great deal under the existing precedents of the police power to help deal with the problems of, let's say, a 24-hour-a-day truck terminal not far away from a residential area.

The history of zoning law is replete with cases of this kind in which action under nuisance law or specific injunction was necessary to abate that kind of a noise problem, whereas zoning could have done it by providing for a site plan review years before. And site plan review in zoning ordinances is a fairly new feat, but it's one which could sensitize the zoning process to the point where you could anticipate these problems simply by adding the dimension of noise considerations in the review process before you build anything.

I believe this, if advocated by the EPA, could have a very powerful effect.

Dr. MEYER. I'm glad that Dr. Dietrich brought this up. I was just looking at one of the attachments to one of the previous witness's testimony.

If you want to use a dollar volume involving construction as a sort of indicator of activity, the Construction Industry Manufacturers Association had an attachment which showed that in 1967, the share of public construction in the total construction activity was 34 percent, which means of course that while public

works—State paid for, federally paid for, city paid for—represent big projects, this sort of thing that has just been discussed represents a major element of concern.

I am glad you brought this up, Doctor. Did you have another question?

Dr. DIETRICH. I wondered if you had anything specific. You talk about site plan review and say it's relatively new, and I think this is site plan review being done by units of local government. It's new to them. I think it's probably something about which they need training and education. Is that a role you see for the EPA?

Mr. MCGRATH. I see EPA playing that role, and I know EPA has some mandate to deal with questions of land use planning in the long run as well, and I think that the advocacy and insistence upon environmental considerations in the land use planning process, whether it be at the scale of metropolitan areas or in the immediate locales—because one needs both kinds of processes in order to keep appropriate controls in conformance with scale—this kind of injection of leadership and support, perhaps direct support for these planning processes, could do a great deal to translate some of the technology into the effects the Agency is seeking.

Dr. DIETRICH. Thank you.

Dr. MEYER. I have an observation which I will make in a moment, and also a question.

I'd like to go back to the airport business for a minute, if I might, because it's a major problem, and it also relates with the highway transportation system, and the private as well as the public sector. This question of economics and the use of land, taking land off tax rolls, is always going to be a knotty issue. And I am not sure I really got the full impact of your feelings regarding a possibility which I believe was behind another question that was asked. It had to do with the possibility of a community or airport proprietor taking land that has been taken out of use because of the need for noise protection, and by instigating proper design of the building and structures, becoming proprietor of the land for industrial activity. How would also take into account another consideration which some forward-looking people have begun to talk about, that perhaps airfreight and air passengers services are going to have to be separated, at least as far as the terminals are concerned, even though they be at the same airport, just as at a railroad station the passenger station and the freight station are separated.

And I wondered if you had thoughts about the practicality and economic impact, and other elements of the tax base?

Mr. MCGRATH. I do have some feelings on these points, Mr. Chairman. First of all, I think the prospect of the airport operator becoming a proprietor and manager of industrial facilities is limited to fairly few airports, particularly as it involves—as they may involve mass movement of airfreight.

At the moment, a great majority of airfreight moves in the bellies of passenger planes, and not all of the airports are located in regions with sufficient freight demand to justify a whole freight terminal, and some of the airports are so located that

the round-the-clock, nighttime operations, particularly, of air freight fleets would be at least as large a problem as they already have with mainly passenger movement.

So one has to be careful about deciding which airports could accommodate this, and then have the potential to develop this as a revenue-generating base.

This problem is being examined at this time by the Aviation Advisory Commission, pursuant to its own consideration of the national airport system, and in conjunction with the Federal aid programs under the Airport and Airways Development Act of 1970.

I think many people feel quite certain it won't work in every location.

And there is the reality that many industrial operations that airport operators would like to have, because of their revenue-generating capabilities, have many other options for location in the same metropolitan region, and in many cases it's just not as competitive for the airport—the airport is not as competitive in the market situation as would be a site of equal size on an expressway somewhere else.

So those are planning factors. Again, I suggest they are comprehensive development planning factors that have to be looked at in this question, and they have not been examined too thoroughly and systematically by the aviation industry at this point.

Dr. MEYER. I think you see what I was driving at. Actually, two problems in one need to be weighed. One is actually an approach Mayor Wise has talked about of using this to in effect produce a market, which Lord knows we need more of in all our highly complex structured environment.

On the other hand, one could also take a look at the thought that when you put certain types of industries you mentioned near an expressway, right at the terminals, that you don't keep those trucks off the expressway because they are going to be close to the point of departure. Although that isn't necessarily always going to be true, because all you are doing is reducing one layer.

I want to be sure we got that in focus.

Mr. McGRATH. I believe that is absolutely correct, and without wishing to seem unduly partial to Texas, I would like——

Mr. WISE. That's OK.

Mr. McGRATH. I would like to say the whole industrial park movement dating back 30 to 40 years moved very rapidly in Texas, before it did in many other parts of the country, and as a consequence, industry has organized in some of the most enormous industrial tracts in the State of Texas, particularly in the Dallas-Fort Worth area, more than anywhere else in the country.

And this provides a natural setting for the introduction of a specialized type of service in airfreight, and this pattern of industrial concentration of certain kinds of operations just doesn't exist in too many locations in this country.

Dr. MEYER. Before moving on to our next witness, there is one thing that seemed to be an opportunity here which we will

want to talk to you considerably about and also with Mayor Wise and the North Texas Council of Governments. It seems to me that what is being done there, although it is a test case before it comes into being, is before and after studies on the noise problem. I think we'd like to talk to you more about some ideas from your side, and also from several other people involved, and compare them with some of the existing problem areas, such as Kennedy Airport. I think this would give us a wonderful opportunity to get points on a curve that we don't now have.

I want to express my appreciation for this very fine presentation.

Mr. McGRATH. Thank you very much, Mr. Chairman.

Dr. MEYER. At this point I am going to sacrifice our ecological break, and go on with the hearing, because we do want to get everybody in.

Is Mr. George Washnis of the Center for Governmental Studies here?

(No response.)

Dr. MEYER. Dr. Kenneth Stewart, director of graduate noise training program, Graduate School of Public Health, University of Pittsburgh, representing Herschel Griffin, dean of the School of Public Health.

We have been talking about the problems and some of the planning and integrating of planning efforts, but it all means very little if you don't have people.

It's highly desirable at this wrap-up hearing to have a presentation on some of the ways to produce the people that are necessary to meet all these needs. We are glad to have you, Dr. Stewart.

Dr. STEWART. Thank you, sir. Mr. Chairman, and members of the panel. For the record, my name is Kenneth C. Stewart, and I am program director of a graduate training program on the faculty of the Graduate School of Public Health at the University of Pittsburgh. I will direct my remarks, or at least some, to the educational needs relating to control of the acoustics in the environment.

**STATEMENT OF KENNETH C. STEWART, PROGRAM
DIRECTOR, ACOUSTIC ENVIRONMENTAL CONTROL,
GRADUATE SCHOOL OF PUBLIC HEALTH,
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Dr. STEWART. Noise energy, itself, existed in the earth's atmosphere long before the advent of man. Probably early natural noise sources were those of wind, rain, insects, animals, land, and ice slides, et cetera. As higher animals and man emerged, noise was unnaturally generated as a consequence of man's need to survive.

Gradually, tools and weapons were fabricated and the world's unnatural noise sources had their beginning. During the ensuing eons of time, man has continued to increase the sound energy density in the environment. With the development of instruments with which to measure sound, it has been possible to quantitatively

document this increase in environmental sound energy density both in industry and in the community at large.

Subtle physical measurements are not required, however, to prove the proposition that sound energy density in the environment has been accelerated by an increasing agglomeration of people and by technological developments over the past several decades. Serving the needs of the expanding society requires more housing, more transportation, sources of recreation, and consumer goods. Each effort to fulfill these growing needs of society produces more noise sources and accelerates the growth of environmental sound energy density.

Thus society is continually enlarging the number, and often the intensity, of acoustic stimuli impacting upon mankind.

The scientific community has long recognized the deterioration of the general environment and that the deteriorating environment has an adverse effect on health and well-being of man. There now appears to be an increasing awareness on the part of society in general that the quality of life is fundamentally influenced by environmental factors.

This increasing awareness of the role played by the environment in shaping and altering the quality of life in the society has led to greater acceptance of higher orders of environmental control.

During the past few decades there has been a growing recognition, as exemplified by Federal legislative controls, that the application of new technology, together with efforts to meet the ever growing needs of society, has upgraded the noise problem to one of national concern. Undoubtedly, the present uncontrolled acoustic environment constitutes a threat to the health and well-being of society, because noise and acoustic stimuli are overloading man's physiological and psychological systems.

To combat the accelerating onrush of detrimental acoustic stimuli and to strive toward acoustic esthetics in the home, and in the cultural setting, there is need for professionals trained in the broad area of acoustic environmental control. A program of training should develop specialized skills in individuals with an adequate background in science and at the same time provide a comprehensive understanding of epidemiological relationships existing between man and his environment.

Overview of the problem—During the past several decades, the industrial and aircraft noise problem has been the primary focus of the scientific community. Vast as the industrial noise and hearing loss problem is, and with due regard for the problem of aircraft noise and the requirements for its control, industrial noise and aircraft noise are only a limited aspect of man's total acoustic environment.

Some of the broader public health aspects of the noise problem have been brought into perspective by the recent joint conference on noise sponsored by the U.S. Public Health Service and the American Speech and Hearing Association. This conference dealt with many areas of the acoustic environment, including the following: (1) Effects of noise on man; (2) Industrial noise and the worker; (3) Noise in the community; (4) Special problems

of recent technological development; and (5) Community noise control.

At the joint conference, William H. Stewart, former Surgeon General of the Public Health Service, stated in his remarks:

We need to know more about the mechanisms whereby the noise damages hearing. We need to know more about the effects of noise and performance and work efficiency in the job setting, and, of course, we need to extend our knowledge outward into the community where people live, to the world of jack hammers and power mowers, and booming hi-fi sets, and screeching airplanes, in what we call home.

Some of these broader public health aspects of the noise problem delve into shadowed areas of knowledge about the effects of the acoustic environment on man. In these areas, quantitative experimental data are limited, primarily, because the direct physiological hazards of noise exposure require immediate attention. For this reason, precise definitions relating to the effects on health of the more subtle aspects of the infringing acoustic environment have not as yet been forthcoming, even though, when considered in the most comprehensive framework, the effects on health of these more subtle problems may be the most significant.

Consider, for example, the sheer exasperation felt by the pedestrian on the street corner when his ears and nervous system are bombarded by the acoustic energy of buses, trucks, motorcycles, and the like, as one of their underrecognized but highly obnoxious byproducts. Does this experience infuriate simply because it is forced upon us and we seem helpless to prevent it, or do these acoustic experiences cause hypertension and cardiovascular changes? Can these indictments be proven, and if so, how? Who are the professionals capable of investigating these issues? How many professionals are there to study these problems? Where are they being trained?

In housing construction projects, whether executive apartments, suburban homes, or lower income urban renewal developments very large sums of money are being spent building acoustic glass houses.

Acoustic privacy is unknown in most of these projects, but lack of acoustic privacy is not unique to improperly designed apartment walls. The hospital, the teaching classroom, and the business office all have their acoustic glass houses.

One of the questions that must be asked is whether the community planners, urbanologists, or public administrators, are really aware of and involved in the requirements for acoustic environmental control. Do they have on their staffs personnel with the commitment and the background to advise and plan with respect to the acoustic environment? Do planners have the acoustic criteria they need to specify acoustic environments in the broad spectrum of community planning? Who will obtain these criteria? What are the legal implications of acoustic control in urban planning and federally sponsored building projects?

In the truest sense, city and regional planners are concerned with the welfare of the individuals who are now and will be living within their planning area. As such, their efforts revolve about issues in economic development, the compatibility of land uses, zoning, and the programing of progress to ensue that the

health and well-being of their community is not only being protected but is being enhanced in the optimum manner based on various objective, although perhaps imperfect, criteria. To perform their broad responsibilities with the greatest effectiveness, planners and those public and private decision makers who plan in fact, if not in name, have over the past several decades broadened their base for rational decisionmaking by developing expertise in many of the fields that impinge on their work.

Planners have, for example, become skilled in urban economics and environmental control, and at the same time they have striven to bring into their ranks those specialists who can add information to ensure that comprehensive planning encompasses the expertise of those skilled professionals who are knowledgeable in planning for specific aspects of the urban environment.

It is only now becoming recognized that the acoustic environment may be as pervasive as any that surrounds man in an urban milieu, and planners are learning that many of the decisions that they have made in the past about land-use compatibility of various functions are invalid primarily because the acoustic environment was ignored at the planning stage.

One of the most poorly planned land uses within a regional context from an acoustic point of view is transportation. As was indicated above, noisy transportation and pedestrian well-being are likely to be found incompatible from a psychological as well as a physiological viewpoint. But planners have failed to consider the impact on health of constructing high-speed roadways through residential areas, and the location of aircraft glide approach patterns where they violate the acoustic sanctity of the home.

What effect does sleep loss have on man's relationship to man in a communicating society? The urban expressway is a particularly disturbing example of atrocious acoustic planning as it often is mercilessly placed through districts that are densely populated by the silent poor, ostensibly because land costs are lower.

The social costs of displaced neighborhoods and the health costs due to exhaust pollutants have been discussed in recent literature, although perhaps not adequately enough, but the acoustic insults that the residents of these communities must suffer have barely been documented.

Another instance where planners have failed to appreciate the need for acoustically compatible environments is in learning and cultural centers where the communicative aspects of acoustic stimuli are the major requirement. How many more cities will build a Pittsburgh Civic Arena—especially designed as a cultural center—only to discover, \$10, million too late, that it is an acoustic monstrosity? How many more federally funded hospitals, research institutions and schools will be constructed where acoustic privacy is neglected and where the teaching classrooms interfere with one another?

There seems to be ample evidence to suggest the need for input to urban planners from professionals who are trained to understand the components of the acoustic environment and who

can interpret this knowledge to formulate decisions and programs that will make this environment more compatible to man's needs.

Specific instances where acoustic considerations have not been fully appreciated with respect to planning and construction might be listed ad infinitum, but suffice it to say that acoustic experts might well contribute to decisions that relate to every activity of man. There is need to determine what elements of the acoustic environment are necessary and beneficial to man and what elements are detrimental to his health and well-being.

It seems apparent that training programs relating to the acoustic environment must take the broadest possible perspective. The acoustic environment embraces noise, acoustic privacy, communications, cultural growth, and the general impact of acoustic stimuli on man's social-psychological, biological and physiological systems.

Thus, acoustic environmental control is concerned with the community at large and should be incorporated into public policy-making decisions that affect community development.

Included in this area are decisions relating to acoustic environmental control in zoning, construction standards, building codes, industry, transportation systems, and cultural centers. Deeply involved in these policymaking decisions are politico-legal personnel who should be a vital contributing part to any comprehensive program of training directed toward acoustic environmental control.

There now appears to be a growing national recognition that the acoustic environment must be controlled. Individuals, in all walks of life, are aware that their health and well-being is influenced by annoying and hazardous sounds. Federal, State, and local governments are establishing codes of conduct with respect to noise in industry and in the community at large. Socioeconomic implications of hazardous and annoying sounds are constantly being evaluated by committees in professional societies and by legislative bodies. The growing national interest in the acoustic environment has resulted in public demand for appropriate control within the community, industry, and in our cultural and social environments.

The acoustical environmental control problem, therefore, appears to be at least twofold: (1) Research is needed to develop control criteria over the broad spectrum of acoustical environments. (2) Professionals are needed with a broad understanding of the relationships of man to his acoustical environment, who are committed to providing acoustical environments specified by defining criteria.

Thank you very much, Dr. Meyer, and distinguished members of the panel, for permitting me to comment at this very important hearing.

Dr. MEYER. Very good. Dr. Dietrich?

Dr. DIETRICH. I want to say that I note a definite encouraging note in your presentation, and I'd like to learn a little more about the program that you are directing at the Graduate School of Public Health at the University of Pittsburgh. I gather it in-

cludes training, education in this matter of noise control in the environment, acoustic environment control, you said.

How many students are presently engaged in this program? Can you tell us a little bit about what has been going on in it?

Dr. STEWART. Yes, I can. The program was funded by the Bureau of Occupational Safety and Health about 1 year ago. The program includes curricula such as basic issues, background, principles in public health practice; it includes the physics of sound, the audiological aspects of sound stimuli such as the anatomy of hearing, the physiology of hearing; it includes courses such as the effects of noise on man, dynamical analogies, noise reduction—in fact, we use Leo (Brannick)'s book "Noise Reduction" in the course; as well as many others.

It includes a course in acoustical materials, a full course in epidemiology taught by the department of epidemiology in the graduate school of public health. It includes three courses in statistics, largely experimental design statistics which are always taught in the graduate school's department of health biostatistics.

It includes a plan seminar taught by a young man out of Cornell University in planning.

These are basically all the courses—there is a course in architectural acoustics.

These are basically the courses taught in the program. As I indicated, the program started, or was funded about a year ago. We now have six students on board. It is a doctor of science program, and we have our seventh student entering in January of this year.

Dr. DIETRICH. Thank you very much.

Dr. STEWART. Thank you, Dr. Dietrich.

Dr. MEYER. Your fellow educator, Dr. Johnson, would like to comment.

Dr. JOHNSON. I believe I will comment. To add to the educational programs, there is another one in Pennsylvania, at Penn State, beginning in 1965, we started a graduate program for master and doctorate degrees in engineering acoustics. However, don't let the name mislead you. It covers all aspects of acoustics, and we had been placing emphasis on trying to get students interested in the environmental acoustics during the past 3 or 4 years. I might add, this has been without great success. At the present time, we have 29 students enrolled, 22 working on Ph. D.'s and only three of them are working on problems that I would consider to be environmental acoustics problems.

And so the thing I wish to point out here is that here is a living experience of where we have the education available for them, and yet they are unable to entice students to go into this area.

And so I think that the problem is not solved by setting up programs. The other part of the program in fulfilling educational needs is to have the students learn that this is an area where people are needed.

And in this respect, I was highly pleased to see the earlier report this afternoon, where they have a unit of study in the primary level. I must admit that we have been less than suc-

cessful in trying to promote education in acoustics at the primary levels.

I am representing the Acoustics Society of America, where our committee on education in acoustics has been trying to promote this for the past 6 years at least. So as I see it, one of our educational problems is to educate people, the young people, that there is a need for people in this field.

Dr. STEWART. I couldn't agree with you more, Dr. Johnson. One of the outgrowths of our own program has been, for example, that at Allegheny Junior College, the dean and faculty came to visit us at the Graduate School of Public Health and were searching for ways that we might contribute as a service function to them to help train their faculty so that they could then go back and begin to train their junior college people in the fundamentals of acoustics and environmental control.

This has been a very active, cooperative effort. At the moment, the usual delays, you might say, have occurred, largely because we are seeking funding to get this program under way, and I think here, for example, is one of the places where EPA could be extremely effective.

When we started back a few years ago, when Sputnik went up and they talked about the new math, and we had to train people in new math to get these programs underway, we had an awful lot of the courses where high school teachers and others were trained in programs supported I guess by the National Science Foundation and other agencies.

I think these programs were reasonably effective, in getting new training into the high school teachers, new knowledge or training into the high school teachers, and bringing this material down to the high school level.

I think this is necessary in acoustics. I think it's essential. I talked about a graduate training program, possibly because that is the emphasis that we have in our own school. But there isn't any question in my mind but what we need undergraduate engineering programs.

You look, for example, at most of the colleges over the country; you can find engineering programs, of course. Electrical engineering—my own background—mechanical, civil. But where can you go, I respectfully submit, and find a real solid program in acoustical engineering that is broad in terms of what we think about in terms of this environment, that really encompasses the environmental aspects, that get at the public health aspects of the problem?

I don't think you can find this sort of training. Of course, you can find isolated courses at universities. We are aware of these courses in many of the universities. But a broad, comprehensive program at the undergraduate level doesn't exist.

It would seem to me this would be one of the vital areas.

I think the junior college level is another area where we must introduce training programs. And going down a step further, because of our association with the U.S. Department of the Interior, Bureau of Mines, that is right across the street from us in Pittsburgh, we are having requests for a service function

to train technicians. It's a 2-week intensive program to handle a little sound level meter that reads the dbA. And then people can go underground and determine whether an operator is in violation of the Coal Mine Safety Act of 1969.

So the level of training starts from 3- or 4-day training courses all the way up to doctor of science training, it seems to me, and this is one of the effective areas where EPA could act to advise the availability of funding for programs of this sort.

Dr. MEYER. That is very well based.

I think your point is well made. I made a note, while you were talking, along with Dr. Johnson, that EPA needs to inquire as to how it can do more to sponsor two things, I think. One of these points is something that neither of you gentlemen mentioned, but which I feel very strongly about, and that is interdisciplinary activity in the educational institutions.

We heard Mr. McGrath, a professor, talking about planning and other elements of the environment. I have had contact with people in law schools and schools of public health and medicine and engineering. And there is a need I think, particularly with regard to the study of acoustics to realize that this solution is a multidisciplinary and interrelated one, and that one of the things we need to do at the graduate level and the undergraduate level is to have an interplay between the various professions concerned.

Second, though, there is a real need to show to young people that this is a fertile field for their intellect, and their activity, and their enthusiasm.

I think that is a challenge we all have. Not only the government. It's not just for the Federal Government. All of us have that responsibility to stimulate that interest.

Mr. BERLAND. I was interested in the fact that you are a director of the School of Public Health, which means you approach noise as a public health hazard, is that correct? I am wondering several things. One, whether there are job opportunities. I don't mean that facetiously, but are you ahead of the game, or is there a lag? Are there job opportunities for people that are graduated by your school, and Pennsylvania, and other schools, in the acoustical area?

Dr. STEWART. Well, we feel there are. We feel that these job opportunities aren't going to just fall in the laps of these people, they are going to have to put in some efforts to go to these people who ought to know of their knowledge and training and ought to know of the benefits that our graduates can perform for them.

For example, we do have instances at the moment in the U.S. Bureau of Mines where they have already said to us, we wish you had some graduates available now. We have only been going a year, so we don't have these people. That is just one instance.

I think these people have to go out to the architects, the engineering firms, I think they have to go to the people who are manufacturing acoustical materials, and they have to do part of the job themselves in seeking employment.

Of course, the university does its fair share in this area, as other universities do. But I can't report on the success of our

graduates obtaining employment, because we have only been operating 1 year. I would hope that what we would see downstream here, though, would be, since the program is oriented in a public health field, so that we talk about people going into State health departments, going into the U.S. Department of the Interior, architectural firms, possibly going into private acoustical consultation.

I would think that our graduates would not find difficulty in employment.

Mr. BERLAND. Part of their job role could be public health education in the jobs they would get?

Dr. STEWART. I'm not sure I understand.

Mr. BERLAND. In terms of education toward the public of environment of noise damage. Is this one of the roles that a doctor who completed your program would have?

Dr. STEWART. I am still not exactly sure—you are suggesting that our program may help educate the public so the public sector and the private sector will recognize that these people are available and can make a contribution?

Mr. BERLAND. No, what I mean is, one of the roles, I understand, of public health people, people in public health departments at various levels of government, city, State, et cetera, is not only control of diseases and environmental hazards, but also the education of the public toward these hazards. Would this be part of it?

Dr. STEWART. Yes, this is true. If I could make one further statement. I did not make, which I think does help us here in obtaining recruits, and this comes back to Dr. Johnson's comment.

I think one of the things that helps us obtain recruits, in addition to the fact that we advertised the program in the Journal of the Acoustical Society of America, is the fact that the program does encompass a breadth that is quite different from the usual engineering programs. We can draw on a biologist, for example, with a good academic record, and bring a biologist into this program as well as an engineer. We don't request or demand that an individual be an engineer to come into the program.

We want people in bio-statistics, and biology to come into this program. We emphasize this, as a matter of fact, in our recruitment.

So perhaps this enables us to get students where a program like this centered in an engineering school might have additional difficulty in recruitment. I don't know for sure, but this might aid us.

We also have, if I may make one further comment before I neglect it, we have on our faculty, as a consequence of receiving the support from the Bureau of Occupational Safety and Health, a health lawyer, who actually has developed a new course in health law directed toward acoustic environmental control, in which he is looking up the case histories, what have been the precedents that have been set, what are the laws over the country, what have been the inputs to these laws, studying this from the legal point of view.

Again, I think this is the kind of thing that our younger

people and those who are looking at our environment are having a vital interest in, not just taking a course, but what are we getting out of this program really. Just more math? Or are we going to be able to be effective?

Dr. MEYER. Thank you very much for giving us, in addition to your prepared statement, a very good dialog concerning some of the needs and problems of the educational area. Thank you very much. Please give Dr. Griffin my best regards.

Dr. STEWART. Thank you, Dr. Meyer.

Dr. MEYER. Is Mr. John Winder here?

(No response.)

Dr. MEYER. Mr. George Coling?

(No response.)

Dr. MEYER. Mr. Robert Evans? Mr. Frank Waldrop? Citizens Association of Georgetown. Mr. Evans.

STATEMENT OF COL. ROBERT F. EVANS, CITIZENS ASSOCIATION OF GEORGETOWN

Colonel EVANS. Mr. Chairman, I am Robert F. Evans, colonel, U.S. Army, retired, representing the 1,500 member Citizens Association of Georgetown of which I am chairman of the Historic Preservation Committee.

Georgetown, a community of something over 1 square mile on the north bank of the Potomac west of Rock Creek, dates from 1751 when its citizens petitioned for a charter. In due course, it became a town and then a city, not losing home rule until 1871 when it was absorbed into the District of Columbia.

Its boundaries were reestablished in 1950 by Public Law 808 of the 81st Congress which provided certain protections for the historic district through the agency of the National Commission of Fine Arts.

In 1967, the Secretary of the Interior designated the historic district a Registered National Historic Landmark. The citizens association was founded after the abolition of the Georgetown City Government in 1871, was reorganized in 1963, and has been accorded judicial recognition as spokesman for this community of 11,000 citizens.

We are informed, Mr. Chairman, that you have already heard more than sufficient testimony concerning the ill effects of aircraft operation over residential communities such as Georgetown. Suffice to say that the citizens association has unanimously voted to fight National Airport by all legal means as a clear and present threat to safety of Georgetown's citizens and to the rightful use and enjoyment of their homes.

The association supports your efforts to procure legislation to protect homeowners from the pollution by noise and dirt engendered by a procession of over flying commercial aircraft. We would emphasize that the damage being done to our community is increasing each year and that it is urgent that antipollution legislation be provided at the earliest possible date.

The association working with sister organizations in the District, Virginia and Maryland, has resorted to the courts for relief,

but present law does not appear to provide adequate protection for homeowners.

Attention is invited, Mr. Chairman, to the Historic Preservation Act of 1966 (Public Law 89-665), which, in attempting to preserve for future generations a genuine opportunity to appreciate the rich heritage of the Nation, authorized the maintenance of a national register of historic sites and a program for preservation for the public benefit of such sites.

Georgetown has been designated as one of these. The law, however, does not provide for protection from air and noise pollution resulting from commercial aircraft operations.

We urge that, in the preparation of antipollution legislation, appropriate consideration be given to the protection of registered national historic landmarks. Such protection should be in addition to the crying need for protection of the citizen in the rightful use and enjoyment of his home. Such legislation would carry out the already clearly-expressed will of Congress as shown in Public Law 89-665, and the Historic Sites Act of 1935.

The national interest in historic sites is as severely menaced by pollution as is the homeowner's interest in his way of life. Aircraft pollution now deprives the thousands of visitors from the United States and abroad of the opportunity to appreciate fully historic sites such as Georgetown. Furthermore, the physical deterioration of manmade structures resulting from pollution effects equally historic buildings and citizens homes.

Mr. Chairman, the Citizens Association of Georgetown appreciates having had this opportunity to express its support for antipollution legislation and looks forward to an early opportunity to testify before appropriate congressional committees in support of such legislation.

Dr. MEYER. We appreciate very much having this testimony. It ties in with some we heard at several other hearings. The effect of noise on historic sites and recreational areas and national parks, and so on.

You can rest assured that we will certainly keep these thoughts in mind in developing our programs. One has to realize that it does become a balance between transportation needs, but we are aware of this problem, and since I visit Georgetown from time to time, I am quite aware of the fact that aircraft straying off prescribed flight patterns do indeed intrude in an unconscionable manner at times.

Mr. WISE. Would your citizens object even to private aircraft or business aircraft, if all commercial aircraft went to Dulles?

Colonel EVANS. The principal objection is to commercial aircraft. Because of the additional noise and the total volume that is imposed by it.

Objection to aircraft didn't really generate until about 5 years ago. That is when it began to really bear down on us; when we would have our meetings, we'd have to stop in the middle of the meeting while we were pounded on.

When people attempt to use their gardens of an evening, it is quite impossible.

Mr. WISE. We have the same problem in Dallas at Love Field, which will be hopefully alleviated by the regional airport concept which was discussed earlier today.

But from the municipalities standpoint, to just do away with—let me speak to Love Field, but it's a comparable example with National Airport—to just do away with that would have a tremendous effect on the commercial area surrounding National Airport—well, Love Field.

And our plan is to hopefully continue Love Field and it seems to be meeting with citizens approval, to continue Love Field as strictly a private and business aircraft, which won't deteriorate the financial situation around the community—motels, restaurants, et cetera—and yet will alleviate that noise situation.

Colonel EVANS. I might comment that we are most fortunate in having Dulles, largely unused, available now to take this traffic. I believe many would join me personally in supporting your view that for company aircraft, private aircraft, small operations, National would be a very suitable spot.

Mr. BERLAND. Essentially your problem is aircraft landing, coming down the Potomac?

Colonel EVANS. They land at National. Their prescribed pattern would theoretically not bring them within a noise imposing area on Georgetown. In fact, conditions being what they are, there is a continual procession, not directly overhead, necessarily. It depends on the wind. Sometimes it's over the river. But the river being in a valley, and Georgetown being a bank of that valley, you get the reinforced drumming all the way up that bank.

Mr. BERLAND. Let me ask a couple of questions maybe for the record. You complained to the FAA?

Colonel EVANS. On numerous occasions.

Mr. BERLAND. And the CAB?

Colonel EVANS. We have made available the telephone numbers to all of our citizens, who have exercised their rights to point out the problem.

Mr. BERLAND. You say that you have no relief from the courts, but you have a very difficult problem in that regard in that you have a multiplicity of government levels and agencies involved.

Colonel EVANS. We are fortunate to have with us Mr. Waldrop who is head of an organization called the Committee Against National, which embraces all of these, and he will follow me.

Mr. BERLAND. So that the Federal level is certainly at this point your only opportunity to relief in Georgetown or a like community?

Colonel EVANS. Short of the German efforts with the dumpling machine, which I am sure you are acquainted with.

Mr. BERLAND. There are other kinds. You can have pregnant women and babies parade across the runways.

Colonel EVANS. We are not authorized yet to do that, in the association.

Mr. BERLAND. That's a peaceful alternative.

Mr. ELDRED. Two short questions. Assuming that you did not close National, but either got the airplanes to fly in some other direction or area, or you got quieter airplanes, could you give me

an idea of how much further away they would have to fly before they would be quiet enough to meet with the approval of the Georgetown citizens, or how much quieter they would have to be?

Colonel EVANS. That question I find very hard to answer. Maybe in percentages—I'd say 50 percent quieter—reduced by half the volume of noise now being imposed on it, that might be acceptable.

Mr. ELDRED. The other question, you noted the historical setting required less noise—because it's a historic town—in addition to the noise requirements of a normal community.

Colonel EVANS. I would not say less noise, sir. I would say that because of being a national monument, it is not only harassing those that live here, but it is harassing all those who come here to see a national monument. They are being deprived. And they are not inside a house, which gives you some insulation.

Mr. ELDRED. So you are saying in effect that there is a greater impact, there are more people that are impacted by this than in a normal community just occupied by the people that live there?

Colonel EVANS. Not only more people, but also more effect on a cultural heritage. There is an educational factor in this, too, of which people are deprived.

Mr. ELDRED. Do you find fewer people come there now because of the noise, or do people leave rather more quickly than they would have left when they are in the area, because of the noise?

Colonel EVANS. I don't believe any survey has been made of this. I would guess your second thought is the correct one, they get out faster than they would otherwise.

Dr. JOHNSON. I have no questions. I just wish to thank Colonel Evans for presenting a very specific example of things that we need to attend to.

Dr. DIETRICH. No questions.

Dr. MEYER. Thank you very much.

Mr. WISE. They motivate me to make a political speech. In all seriousness, thank God for people like you, who back up your feelings with organizations, and with real intelligence. Obviously you have engendered the support of the citizens.

I would be less than honest if I didn't tell you there are some politicians and people who hold government office who probably hate organizations such as your on occasion, but it's far, far better than people who just don't care or who go ahead and suffer and never say anything.

So I would like to compliment you both. Thank goodness we have people like you who really bring dramatically to the person who holds government office, and I encourage you to keep going.

Colonel EVANS. Thank you very much.

Dr. MEYER. Now may we hear from your colleague.

STATEMENT OF MR. FRANK C. WALDROP, CHAIRMAN, THE COMMITTEE AGAINST NATIONAL

Mr. WALDROP. My name is Frank C. Waldrop, I am chairman of an organization called the Committee Against National. My address is 4900 Loughborough Road, NW., Washington, D.C.

Mr. Chairman, I didn't prepare a written statement because I had in mind only to supplement Colonel Evans with certain specific points.

Dr. MEYER. Fine. Go right ahead.

Mr. WALDROP. It happens that I have just finished a hearing before the Civil Aeronautics Board which might be of interest to you to know a little about, because this is the first case that has been heard by the Board under the considerations of the Environmental Policy Act of 1969.

Now I appeared as a party with full rights granted by the Board—this is the first time this has ever been done—on the same footing with the airlines and contestants back and forth for licensing. This is entirely new. I had been there before and been thrown out and told to beat it.

But something has happened, which brings you here.

Now the interesting thing is that the Board invoked the environmental considerations in its order for hearing, but then, when the hearing came on, no attorney for the Board raised the questions of environmental impact. The Board brought on no witnesses. It was passive on this issue.

The Federal Aviation Agency was passive on the issue. In fact, I must tell you that everybody was passive on the issue except the witness now testifying here.

And the applicant for license did file an environmental statement as to what effect he intended to cause, but then, on examination, he declined to be bound by his testimony. That is to say, that when I asked him if he would agree that the Civil Aeronautics Board would write his license based on his NEF expectations, he said no.

And when I asked him if he would agree to have his license stipulate that he couldn't use any equipment except that which would produce the NEF-20 contour that he was claiming he would have, he said no.

And nobody for the Government of the United States rose up to do anything about that.

Now this case is still in hearing. I will give you its number. It is 17665. It is called the "Re-opened Washington-Baltimore Helicopter Investigation."

This beauty has been going on since 1963. And the reason for it at all is the Civil Aeronautics Board feels that the National Capital, as a matter of prestige—I don't know why—should have helicopter service. And it's been trying to get somebody to take a license and act on it.

A consortium of airlines did in one phase get a license, and then discovered that that really wasn't the end of the problem. They had to get a zoning regulation in the District of Columbia, and they couldn't get it, so they had to go back for a new hearing. And now there is another rigamoro on.

But it has, over the years, envolved with new statutes overtaking it. The Environmental Policy Act has come into these hearings. It's a classic illustration of its kind. But in its final stage, it illustrates that writing a law doesn't solve a problem.

The Environmental Policy Act is there, but the CAB is not

interested in it. The FAA isn't interested in it, and the only people that I know interested in it are gutter fighters like me.

I have been in this thing since 1966, when the FAA reversed its own policy in which it had announced that it would not put jets into National, and then put them in and extended itself into places such as Georgetown where it had not been before.

One of your witnesses here testified precisely on the point that a change in operating technique by an aviation system puts it in places that it has not been. Georgetown has been there longer than National. I have been living where I live since 1946. National Airport was not a problem until they changed what they were doing and offered no apologies.

And I read the testimony of Mr. Berger. I could supplement that 50 ways. I won't waste your time with repetitious material; but I assure you he hasn't exaggerated the problem at all.

If you will bear in mind, National and Dulles Airports are the only two airports operated by the FAA anywhere. And there has been quite an interesting thing since we have formed this committee, which is a committee of committees, Mr. Mayor, of citizens associations all up and down the river, all having delegates to it.

So it's quite interesting how in this community people get things done. There is no more skillful set of citizens, no more troublesome set of citizens I guess on earth than live around here, because everybody here is in government somewhere. So they really become quite effective.

And over the years, I have been in court, before executive agencies, and before Congress, and it is still astonishing how much has come out of it in the way of really bringing the government's attention to something its doing to people without thinking anything about it.

That is the lessons of FAA management, and the result is, I am sure you may have heard about it, that there is now a proposal to sell National and Dulles off, get them out of the Government inventory. And they ought to be out, and I may tell you that as far as closing National is concerned, the most surprising people turn up.

Senator Dominick of Colorado introduced a bill to close National, and this was something of a surprise. And then one of the great aviation buffs in Congress got up and made a speech endorsing it a hundred percent, and I wouldn't ask you to guess, it was Senator Goldwater. Thank you very much.

Dr. MEYER. Thank you, sir. Does anyone on the panel have any questions or comments?

Mr. BERLAND. I want to make a little political speech. I think what you emphasize here is the need and the benefits of citizen action. I think citizens express their feelings and opinions in other ways than at the polls.

Mr. WALDROP. They certainly do here.

Mr. BERLAND. It's an important place to do it, but I think another important place is such activities as yours and the Colonel's. I think this is the way citizens can express themselves between the polls, between election times, how they feel and what their desires are.

And I am happy to disagree with you slightly that this is the most active citizens group. We like to think the community where I live, along with three other communities, where we have a committee of committees—a similar type structure—we were able to maintain 60 of the 90 acres of North Town's Laurence C. Warren State Park—the only State park in the city of Chicago. Right on.

Colonel EVANS. May I make a comment? I responded to a question as to what reduction in noise would be acceptable and I was speaking personally, and not for the association. I am quite sure that the initial reaction of the association would be much less generous than the comment I made.

Dr. MEYER. We understand that.

Mr. WALDROP. Nobody asked me, but I would supplement it by saying, go back to the DC-3, which is what National was built for.

Dr. MEYER. Thank you, gentlemen, very much.

Before adjourning, I want to insert into the record—let the record show that the testimony which would have been given by Mrs. Betty A. Little will appear in the record at this point. Also included will be testimony by George E. Coling, Jr.

(The material referred to follows:)

PREPARED STATEMENT OF MRS. BETTY A. LITTLE,
ENVIRONMENTAL RESEARCH ASSOCIATES

My name is Mrs. Betty A. Little. I am a professional environmental economist with more than 20-years experience in business, finance, teaching, and conservation. At present I am vice president-education for Environmental Research Associates of Basking Ridge, N.J., coordination/vice president Citizens for Conservation, Bernards Township, a trustee of the Passaic River Coalition, Dollars Worth chairman for the N.J. division of the American Association of University Women and a member of the National Board of Advisors on Finance, and a member of the American Economic Association.

For nearly 10 years we have been developing a body of economic theory in fields such as welfare, resource, urban, and financial economics which could be related to the evaluation of environmental concerns. Some of this is highly sophisticated and involves the use of econometrics. With this as a background, Environmental Research Associates is engaged in developing a body of environmental economics which has practical application. To do this it must be understood, accepted and supported by the public, it must stand up in a court of law and it must be easily incorporated and enforced by governments in their laws and their activities.

We have begun to calculate the cost of building in a flood plain, for example, and it has become apparent that building in such an area is very expensive in terms of losses in dollars and man-hours to the homeowner, in terms of insurance often paid by government, in terms of disaster funds also paid by government and in the eventual need for flood control construction of huge proportions which must be paid for by all the taxpayers in the country.

Now we must begin to look at noise in the same way and to arrive at total cost. But the problem is most complex. In the case in Elizabeth, N.J. of the highway which was built close to the school. The school was able to recover the cost of air-conditioning to shut out the noise. If this principal would be applied to airplane noises over Newark then the cost of noise would be the cost of air-conditioning part of the city. It would become evident then that the least cost method of handling noise is not to air-condition buildings but to change the construction and use of airplanes.

This example brings out a number of points which makes the evaluation of noise a difficult procedure:

- (1) While some compensation would be made for shutting out noise none

would be made for the loss of other factors such as the use of the outdoor space.

(2) The noise factor cannot readily be disassociated from other factors such as air pollution.

(3) Compensation is made only in the extreme case which does not provide for the different effect noise has upon different individuals—noise tolerance for some is less than for others.

(4) In any case the costs of noise are already being borne by someone. We are not talking then about bearing costs but about how these costs shall be calculated and to whom they shall be assigned—to the manufacturer, the user, the government or to an innocent bystander.

Most of the work we are doing relating to noise is part of an overall pollution problem. For example, at the George Washington headquarters in Morristown where we are acting as consultants to the Conservation Commission which is seeking a cover and a park for over #287 to protect a national park, a school and an arboretum noise is only one of a combination of factors.

As the public becomes more aware of the loss in environmental quality due to noise we can expect a greater demand for abatement. Much more work needs to be done in the field of economic evaluation and in determining how these costs shall be assigned so that they will have a minimum impact upon our overall economy.

I would urge your committee to seek ways in which to stimulate such research either through grants or through public education programs. It is evident to me through my national contacts that there is a very great interest in this subject and a need to develop an orderly process for the abatement of noise.

PREPARED STATEMENT OF GEORGE COLING, DIRECTOR OF
ECOLGY CENTER COMMUNICATIONS COUNCIL, WASHINGTON, D.C.

Noise is part of urban life. However, we are just beginning to realize that it is not a necessary part of urban life. As demonstrated by representatives of industry, government, and the academic community at these EPA hearings, noise is a fairly easily controlled environmental pollutant. It is not a lack of technology, but a lack of concern, as expressed in financial terms, that appears to be upholding the cacophonous status quo.

I understand that your hearing in Boston dealt with the physiological and psychological effects of noise on man. Although I have done but cursory reading in the field, it seems that there are two schools of thought in this area—one believing noise to be a creator of severe psychological and physiological stress, another believing that noise causes only hearing loss. A violent debate goes on between advocates of these two schools of thought. However, this debate is only an academic one, carried on at the expense of millions of urban residents whose lives are filled with noises that can be termed "disturbing" at the very least. Every urban dweller suffers from the effects of noise every day of his life, whether it be traffic noise, aircraft flyover noise, or construction noise. It does not require any expertise to note obvious effects of noise on the human body. We all have felt anger at low-flying noisy aircraft, or felt a quickening of the pulse as a conversation is interrupted by a compressor at a construction site.

I live off of Connecticut Avenue—half a block from a Metro construction site. I am often lulled to sleep by construction noise and blasting which lasts until 11 p.m. At 7 a.m., I am awakened by the same noises. Many mornings, it is literally impossible to sleep beyond 7 a.m. It would seem to me that the construction of such a farsighted project as Metro should not be undertaken without any concern for noise control. I know that many kinds of quieter construction equipment have been developed and are on the market. Ingersoll-Rand, for instance, has a compressor which produces 85 dbA at 3 feet, as compared to an ordinary compressor which produces 110 dbA at 3 feet. Also being marketed are quieter pavement breakers and jackhammers. Without this quieter equipment available, it is very incongruous that a partially federally funded project like Metro takes no steps to lower noise levels, especially since the Federal Government, the EPA, claims to be so concerned about noise. Noise resulting from construction should be taken into account when environmental impact statements are submitted. In any case, I would like an explanation as to why this kind of environmental impact is ignored.

Lack of concern about noise as an environmental problem is symptomatic of the kind of cost-benefit analysis methods which are in operation. The external costs of noise, absorbed by the general public rather than the creator of the noise, are ignored. As long as it is the public who pays, both symbolically and literally, there is little chance that the truly responsible parties will feel enough twinges of conscience to control their own noise. What is needed is, in part, public education—if the public knew that quiet is an attainable necessity, not an unattainable luxury, perhaps they would boycott noisy products or urge their local, State, and Federal Governments to "buy quiet." What could be a more effective tool for spurring on the production of quieter products than every level of government responding to citizen's demands that their governments use only the quietest of products?

Aside from becoming educated, the public must also feel that there are channels through which they may effectively make complaints. How many complaints are made silently as a jet aircraft flies overhead, disrupting conversation or the enjoyment of a crisp fall day? How many of those complaints are never vocalized because people feel that nothing can or will be done. As an example, this past summer, one of Washington's most charming traditions, the Watergate concerts, was lost because of noisy aircraft flying overhead. Given a choice, people would certainly choose Watergate concerts over disruptive noise. In fact, people did choose—many complaints were made. But the end result was the loss of the concerts, not the control of aircraft flyover noise. As long as these kinds of choices are made by governmental authorities, it will be difficult to convince people that noise is a solvable problem.

Unless the Federal Government stops working at cross-purposes, and until it develops a commitment to environmental quality that is something more substantial than a rhetorical commitment, there is no way to involve people in the decisionmaking process. Once the mythical average citizen has made a complaint and seen his complaint produce no change, he is not likely to complain again. Even worse, when that same average citizen sees his government talking about the need for quiet, the importance of noise control, and at the same time allowing aircraft to take precedence over people, and failing to follow its own advice about quiet construction methods, it is difficult for him to believe that the government is indeed committed to the things to which it claims commitment.

What the entire Federal Government needs to realize is something that Aldo Leopold, writing in *Sand County Almanac*, realized 20 years ago: "A system of conservation based solely on economic self-interest is hopelessly lopsided . . . It assumes falsely that the economic parts of the biotic clock will function without the noneconomic parts." The Environmental Protection Agency is essentially useless unless it makes the actualization of a system of conservation based on more than economic self-interest its primary goal.

Dr. MEYER. At this point in our proceedings, then, the Environmental Protection Agency's hearings on noise are adjourned. Thank you.

(Whereupon, at 4:25 p.m., the hearings in the above-entitled matter were adjourned.)

(The following material was received for the record:)

DEPARTMENT OF TRANSPORTATION,
FEDERAL AVIATION ADMINISTRATION,
WASHINGTON, D.C., DECEMBER 22, 1971.

Hon. WILLIAM D. RUCKELSHAUS,
Administrator, Environmental Protection Agency,
Washington, D.C.

DEAR BILL: The Administrator has asked me to acknowledge your letter of 14 December inviting the Federal Aviation Administration to comment on the testimony of Mr. Michael M. Berger, given during the public hearings conducted by EPA in San Francisco on 28 September 1971.

Subsequent to the hearing, Mr. Berger released a considerably expanded written version of his testimony. We were provided with a copy of that statement and have been in the process of preparing an FAA response.

We appreciate very much your invitation to submit our comments to EPA

before the hearing is made a public record. I would anticipate that we should be transmitting our comments to EPA shortly after the first of the year.

Sincerely,

GEORGE U. CARNEAL, JR.,
General Counsel.

STATEMENT OF ARUN G. JHAVERI, ACOUSTICAL ENGINEER,
HARRIS F. FREEDMAN & ASSOCIATES

As a practicing acoustical engineer and consultant, I am mainly involved in the problems of controlling and reducing excessive noise and vibration. We have worked with local, regional, State, and national organizations and institutions. Among these are the Boeing Co. of Seattle, University of Washington in Seattle, and Department of Transportation.

I would appreciate your including the following points as part of my testimony, in the "overall testimony" during the current hearings:

(1) From my own work-experience and educational qualifications, I am convinced that "Noise" and "Vibration" go hand in hand, whenever one talks about "mechanical wave energy." In other words, it would be a worthwhile step in the right direction if the name of ONAC is changed to the Office of Noise and Vibration Abatement and Control. In our work, be it engineering or consulting, we have found that in many cases of equipment and industrial noise problems, the reduction and/or control of vibration and vibration-induced noise, prior to actual noise abatement work, makes engineering work very simple. A typical example of such a problem is the unbearable noise environment near heavy-duty air-conditioning system.

It is found in many instances that the rotating components of air-conditioning unit, such as the fan, motor, and pulleys (either of condenser type or compressor) are vibrating excessively after the system is installed. The main cause of the excessive vibration is lack of static or dynamic balance in each component. Because of this, part of the useful mechanical input energy is converted into unnecessary output energy, in the form of excessive vibration and vibration-induced noise. In addition to the air-borne noise, generated by the rotating fans, the overall noise observed near the air-conditioning system consists of noise that has been transmitted by the vibrating floors panels in the close vicinity of the system.

It is not difficult at all to measure and analyze excessive vibration with a portable vibration analyzer. It is also easy to statically and dynamically balance all rotating machinery components. After these two aspects of vibration reduction are carried out, it is appropriate to measure and analyze different frequency components of noise for possible noise reduction to comply with design tolerance criteria.

Thus, along with standard noise-control techniques, one must employ vibration-reduction techniques to solve the overall problem of noise and vibration-induced noise.

(2) The Environmental Protection Agency must compile a list of practicing acoustical consultants throughout the country.¹ This would be available for all private and public sectors of government, industry and public for the determined fight against noise as well as to control environmental noise and vibration pollution. Thank you very much.

STATEMENT FROM THE PITTSBURGH HEARING AND SPEECH
SOCIETY, INC.

October 17, 1971, the Pittsburgh Hearing and Speech Society, which is the major community hearing and speech rehabilitation center in Western Pennsylvania, participated in an Allegheny County Environmental Fair and Festival by presenting displays concerning noise levels from various community and home sources, having staff and volunteers to answer questions and hand out materials concerning noise pollution. This is a part of our Public Information Committee's program.

During the afternoon, a man considered to be the dean of newscasters in the Allegheny County area, came up to the booth, and asked the audiologist and volunteer staffing the booth: "Just why is a hearing and speech center concerned with noise pollution?"

A citizen standing nearby, who overheard his question, blasted her answer

¹For example, this type of information was requested during the current hearing by the National Home Builders' Association (testimony given on Tuesday, Nov. 9, afternoon).

before the staff member could reply, describing sleepless nights and frayed nerves from trucks and cars on the Pennsylvania Turnpike and drone of machinery from a cement plant, both sources located 2 miles from her suburban home! She had been asking the hearing and speech representative about the levels of these sounds in relation to her family's hearing.

If it were possible for the society's professional staff to attend the EPA hearings on noise abatement and testify this week, we could submit testimony regarding the physiological effects of noise. We could relate the high economic and social costs to the person with hearing loss in seeking employment, educational advancement, or remaining in the stream of life. We could express our concern over the number of young people coming to the agency for service with noise-induced hearing loss—a type, as you know, of damage to the inner ear which cannot be repaired by surgery or helped by hearing aid devices.

We have no doubt that your officers have heard and assembled great volumes of testimony on these topics during your hearings this year.

Therefore, we plead for a gigantic and relentless citizen awareness effort through our schools, churches, media, civic, and social organizations to get one message across: Americans, stop, really listen, you won't like what you hear!

People in our society today are looking and growing inward as an escape mechanism from the pressures and the noise that surrounds them 24 hours per day.

Before it is too late, make our citizens aware of noise again—when they are aware, they will work to control the growing decibel levels before the previous gift of hearing—that tiny line of sound which provides communication to and from other human beings—is lost.

Work to make all of us—citizens, legislators, managers, and workers—aware of the human and economic costs of hearing loss—that loss of hearing is generally accompanied by loss of speech—as you must hear what you yourself say in order to retain the ability to speak clearly.

Make us aware that auditory training and aural rehabilitation become a lifelong proposition for a person with hearing loss—the other alternative being isolation from other people.

Make us aware that, although many of us have stopped listening as an escape mechanism, the noise and the hearing loss go on. Even in sleep, we cannot shut out sound from the auditory nerve and cells. We can rest our eyes and shut out light by closing our eyes, but no such mechanism is built in for our ears!

If a leading newscaster in a county of 2 million people cannot find a relationship between a community hearing and speech center and noise pollution, all groups, individuals, and governmental agencies working in the field of noise abatement have a monumental educational task! Let's get on with it with the full cooperation of all of us. Let us achieve the Federal, State, and local government standards and programs which will make any effort enforceable.

STATEMENT OF HAROLD K. HOWE, OUTDOOR POWER EQUIPMENT INSTITUTE

The Outdoor Power Equipment Institute, Inc., is the national nonprofit trade association for the manufacturers of power lawnmowers, motor tillers, rotary snow throwers, lawn and garden tractors, lawn vacuums and leaf blowers and gasoline powered nonportable lawn edger/trimmers as well as for manufacturers of small horsepower gasoline engines for the above listed consumer products. A copy of our roster of present members is attached.¹

The products of our members covered by OPEI activities are almost exclusively used in areas inhabited by people which would seem to exclude consideration of product noise with regard to wild life.

The medical data used as the criteria for the Occupational Safety and Health Act Standards were based on industrial environment involving daily routine exposure to noise for 40 hours per week, 2,000 hours per year over a working lifetime of approximately 47 years. Where our products are used commercially that medical data may be reasonably pertinent. However, for the average householder consumer the exposure is probably far less than 100 hours per year. Nuisance noise is the real problem of the

¹ This list is on file at the Office of Noise Abatement and Control.

Outdoor Power Equipment Institute products. Determination of appropriate levels of nuisance noise is difficult because of the subjective nature of the problem. Solutions to nuisance noise will probably limit hearing loss problems for the operator, but additional medical studies need to be made to determine sound medical data to safeguard the hearing of the operator and/or bystanders from such nuisance noise. Such studies must include consideration of the noise level drop from the outside to inside of residences based upon summer and winter weather characteristics.

The OPEI recommendations would include the following:

(1) The Outdoor Power Equipment Institute supports Federal preemption of any rulemaking relative to noise emissions from our products. Local governmental units should be the rulemaking source limiting the use of products such as zoning, limiting times of day, etc.

(2) Any noise level limitations should be consistent with the current technology within reasonable additional cost to the consumer. Future goals should be established or least carefully reviewed, approximately 2 years prior to the date that is suggested for them to become standards. The review should be made of the then existing technology available to achieve the standard at a reasonable cost to the consumer and with the technical knowledge then available of the desirability to reach these lower level standards.

(3) Throughout the procedure of standard setting, we urge that all concerned consider the cost to the consumer of standards that precede economical technology. It would be a paradox to make lawn mowing so expensive that home owners would resort to other means which in turn might greatly hamper our other efforts of environmental protection.

We hope that this statement may be included in the records of the hearings and assure you of our industry's sincere and continued interest in this problem.

STATEMENT OF HENRY L. DIAMOND, COMMISSIONER,

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

The modern world is full of sounds generated largely by mechanical devices. A typical day begins with the clamor of an alarm and ends with a late evening news broadcast. In between, our ears are subjected to a great variety of sounds from many sources: transportation, construction, industry, recreation, communications, and many others. Some of this sound is good, but much is unnecessary, harmful, annoying or otherwise undesirable and worthy of the description noise. Just where the dividing line between acceptable sound and noise should be drawn is not clear. It is, none the less, certain that there is too much noise and that immediate action should be taken against this invisible pollutant.

Many States and even cities are now trying to control noise. Their independent efforts are commendable and reasonably effective locally but the leadership of the Federal Government is needed to achieve success. Four steps by the Federal Government can unify these efforts, accelerate their progress and encourage further participation by State and local governments. It is the opinion of the State of New York that the Federal Government should without delay:

(1) Undertake a vigorous program of research into the extent of noise pollution and the means to control it.

(2) Establish basic standards for sound emission from mechanical devices, particularly transportation vehicles, and allow States and their subdivisions to set more stringent standards as necessitated by local conditions.

(3) Provide financial aid to States and local communities to assist in bearing the additional cost of noise control programs and to enable the establishment of minimum program standards throughout the several States.

(4) Stimulate education of scientific and technical personnel to create the needed pool of trained people to carry out noise control programs at all levels of government and industry.

NOISE EMISSION STANDARDS

Most troublesome sound is produced by mechanical devices. It is much better to control the production of this sound than to try to isolate or attenuate the noise after it is produced. Noise emission standards are, therefore, a logical part of a noise control program.

Transportation noise is one of the most serious problems and causes most public complaints. The very nature of most vehicles is to take their noise to many cities, even many States, in a single day. A maze of conflicting local

regulations can only result in chaos. The Federal government must promulgate basic standards for transportation noise.

Other mechanical devices are more amenable to State or local control as modifications could be made according to local regulations. The public interest would be served through lower costs if the Federal Government established uniform, basic noise emission standards. Such uniform standards would also encourage individual compliance and simplify the enforcement process.

New York believes that States and local communities must retain the ability to establish standards more stringent than the basic Federal standards. Such flexibility would provide the means to handle special local problems when the need can clearly and reasonably be demonstrated. Some proposed Federal legislation, (for example, H.R. 11021, also H.R. 5275 and the identical bills H.R. 5388 and H.R. 6578) would deny the States the power to make more stringent standards and would only allow restrictions on the use, operation, or movement of the machines. One example suffices to show that this is not in the best interests of noise control. Consider road noise. A realistic national standard on motor vehicle noise could allow great excesses on the crowded, confined highways within cities, such as New York City's East River Drive, where apartment houses and offices virtually hang over the road. On the other hand, restrictions strong enough for the city would be an unnecessary burden elsewhere. Would the only recourse for New York City, or any large city desiring quieter streets, be drastic limitations on the use of motor vehicles?

RESEARCH

Noise emission standards based on today's state of the art will help stem the growth of noise pollution but can not be considered a complete noise control program. A vigorous and well coordinated research program is needed.

As mentioned earlier, it is not even clear where sound becomes noise. Before a meaningful, quantitative definition of noise can be made, much more will have to be known about the physiological and psychological effects of sound.

It is well known that long exposure to excessive sound levels causes permanent hearing damage, but the sound level at which such damage begins is still uncertain. The Walsh-Healey Act considers levels below 90 decibels on the A scale to be safe for an 8-hour working day, but some research has disclosed hearing damage at lower levels. Clearly, more scientific investigation is needed.

Even less is known about the other effects of sound particularly the long range effects. Loud or sudden sounds cause immediate physical reactions, the eyes dilate, the liver releases extra sugar, and changes in circulation occur. After a while these factors appear to return to normal but the effects of prolonged or repeated exposure are not certain. Psychological effects too need investigation. Does sound have any relation to mental health? Can excessive sound cause tension or reduce efficiency? Questions like these must also be answered.

Better understanding of the effects of sound will almost certainly show that current sound levels are too high. To reduce sound levels, more must also be known about physical acoustics, the engineering principles for reducing sound production, improving isolation or increasing attenuation.

The Federal Government is best equipped to assume the primary responsibility for this research. Being able to draw upon the resources of the entire country, the Federal Government can choose the best available research organizations and hold costs down by preventing wasteful duplication. Even the best scientific information is useless unless it is available to those who need it. Again the Federal Government is well prepared to publish the information through the Government Printing Office and the Clearinghouse for Federal Scientific and Technical Information. Finally, Federal sponsorship of research in colleges and universities will stimulate the training of technical personnel.

FINANCIAL ASSISTANCE

A successful noise control program must involve all levels of government. Research and basic sound emission standards have been described as properly being Federal responsibilities. Given these basic elements of a noise control program, it will still remain for the state and their subdivisions to continue with the details of program implementation, including education and en-

forcement. These activities must be carried out through State and local governments because only these organizations will be able to sense their particular problems and react to them.

Active participation by States and communities can best be encouraged by substantial Federal grants to ease the financial burden. Public interest strongly favors noise control so the only limitations will be the resources available.

The need for financial assistance was recognized in several proposed Federal laws in 1971. Substantial grants to States and communities were included in H.R. 3364 and H.R. 5301, H.R. 6002 and H.R. 6986. We urge the Federal Government to include financial aid to States and localities in its noise control legislation.

TRAINING

One final ingredient for a successful noise control program will be an adequate technical staff. Special training and experience in acoustics are a necessity but broad experience in other disciplines such as transportation, mechanical design, electronics, and architecture are also needed for noise control. To enhance public acceptance of the program it will be desirable to have a staff large enough to provide technical assistance to the community avoiding the negative aspects of a program limited to enforcement.

The necessary education can be provided through the means already proposed. Federal sponsorship of research in colleges and universities will insure the development of academic programs in acoustics and noise control, and provide the necessary scientific personnel. Administrative and enforcement personnel will require less technical training with a greater emphasis on State and local regulations as well as the basic Federal standards. Provision for this training could be included in the Federal grants.

We are anxious to achieve a productive noise control program through cooperation at all levels of government under firm Federal leadership. We believe the suggestions made here will contribute to such a program and urge that they be followed.

NOISE IN CONSTRUCTION OF INDUSTRIAL PLANTS

STATEMENT OF FRANK H. WALK, P.E. WALK, HAYDEL & ASSOCIATES, INC.
NEW ORLEANS, LA.

The wide variety of conditions confronted in the construction of industrial plants of different types in many different locations results in a variety of noise intensities, time patterns and frequencies; only some of which are objectionable. To date very little attention has been given to the reduction of noise in industrial plant construction due to a number of factors. Known technology can reduce most noise levels below the objectionable point when applied to construction equipment and methods. Noise abatement regulations must be prudently imposed in the construction industry in order to avoid greatly increased costs in an area which is already staggering.

Our company specializes in the design and construction management of industrial plants. Most of our experience has been in the southern part of the United States and has included plants for petroleum refining, petrochemicals manufacture, food processing, pulp and paper manufacture, cement manufacture, metals processing and fabricating, and others. My comments are based on 30 years of experience, with our present company and elsewhere, in the design and construction of industrial plant facilities. My discussion will be more general than technical, leaving to others the coverage of measuring noise in terms of sones, phones, Hertz units, decibels, etc.

Before discussing noise in construction it seems appropriate to review briefly for comparison purposes the attitudes and progress of industrial plant owners towards the reduction of noise pollution in the operation of their manufacturing and processing facilities.

Our experience indicates that most plant owners are quite interested in having effective noise control in their respective industries. Outside of the strictly humane and legal aspects they are well aware of the advantages to be gained in better employee relations, improved communications, less employee tension, higher production levels, and reduced error factor; all of which can be realized through a good noise reduction program.

Much progress has been made in the isolation and reduction of objectionable plant operating noise. Through study and research effective technology has been developed and largely proven so that reduction in noise levels for most manufacturing equipment and operations can now be achieved at a

reasonable cost if emphasis is placed on this criteria prior to, and during the design and construction phases. The higher costs and relative ineffectiveness of reducing noise levels in an existing industrial plant have been well documented. For the most part the lessons learned are now being applied to future plant design through the imposing by plant owners of maximum noise level specifications for industrial plant equipment and processes.

From our observations there has been far less progress toward noise abatement in the construction industry serving industrial plant owners.

It is true that the wide variety of conditions confronting the industrial plant constructor in many different geographical locations and plant types results not only in a variety of noise intensities, time patterns, and frequencies but also in a considerable variety of noise abatement requirements imposed through legislation, social pressure, etc. However, it is also true that the average industrial plant construction contractor has been subjected to much less noise abatement pressure (or incentive) than has the average industrial plant operator. This is due largely to the fact that the construction operation and its associated noises is of a temporary nature and better to be tolerated than is the long-term permanent type manufacturing operation which moves in to use the facilities when the constructor moves out.

The majority of the new plant construction (at least in our area of activity) takes place in relatively undeveloped rural locations. While residents or service businesses sometimes move in around the plant later they are not present to be annoyed by construction phase noises.

Due to the open air surroundings existing for most phases of an industrial plant construction project especially in the mild climates of the Southern United States, the construction workers themselves are subjected to less noise exposure and fatigue than they might be under different conditions.

The fact remains that equipment and operations currently used in the construction of industrial plants do produce noise, a good portion of which must be classified as objectionable when measured by the criteria generally used by industrial plant owners in evaluating their own manufacturing operations. Draglines, bulldozers, and piledrivers used in grading, excavating, and foundation installation operations are practically always a source of noise nuisance. Portable steam boilers and air compressors required in heavy construction usually produce objectionable noise. Headache balls and jackhammers used in preconstruction demolition work cause excessive noise and vibration. Welding machines, pneumatic hammers, power saws, pneumatic wrenches, drills, reamers, concrete mixers, dump trucks, etc., all produce noise some of which would be classified as objectionable depending on conditions.

Most industrial plant construction contractors have substantial firms with excellent management, who given the proper incentives we feel will be quick to recognize the advantages of a good noise control program. Just as their manufacturing industry counterparts have already done to large extent, they will be easily convinced of the better public relations, better employee relations, improved communications, reduced employee tension, higher work production levels, reduced error factor and lowered legal risks involved in a well planned and executed noise pollution abatement program.

With a few exceptions we believe that in general adequate basic technology already exists to effectively implement a program to reduce construction equipment noises to acceptable levels. This basic technology has been developed and checked out to large extent in other industries. Some additional development and engineering effort will be required to economically and effectively adapt certain present technology to analogous applications in construction industry equipment and operations.

Pile drivers generally require steam or compressed air for lifting or forcing the hammer. There are many noise generators associated with this operation. Most prominent is the intermittent blow of the pilehammer; although sound is of short duration, it is literally an ear-splitting experience. When steam is used as the working fluid, noise can radiate from high velocity flow in pipes, valves, and also by venting; boilers for generating steam are noisy because of combustion phenomena and air aspiration. Use of compressed air requires a compressor and a driver; both pieces of equipment are substantial noise producers. Some of the noise associated with pile-driving equipment can be eliminated quite readily. Changes to equipment could include replacing of valves and use of silencers on vents. Design changes to boilers, compressors, and diesel drives are also possible; however, Band-

Aid type modifications to these major pieces of equipment are not as effective nor as economical as advance specification of noise abatement accessories on new equipment. Vibratory equipment for pile driving is a relatively recent development; the vibrator is normally operated at resonant frequency. Such equipment is unusually quiet since the only noises obtained are from the motor and the hum of the vibrator; in addition, ground vibrations extend only a few feet away. The fact that pile-driving rates are many times faster with vibrator equipment than with conventional equipment is an added benefit.

Earthmoving and dragline operations also produce relatively high noise levels. Sound levels with these types of operations have been increasing with the newer, larger equipment since horsepower required has also been increasing. Such equipment usually has little or no provision for exhaust mufflers. There will be some sacrifice in horsepower with the use of exhaust silencers.

Jackhammers and impact hammers can radiate considerable sound power, particularly when a large number of units are operated simultaneously. Noise is generated by the exhausting air as well as sound resulting from the impact force. Use of new materials for sound dampening and silencers on exhaust air vents would reduce noise substantially. Pneumatic silencers, which are comparatively simple and cheap, can reduce noise levels considerably in the critical midfrequencies. Some of the newer model hammers incorporate a silencer within the tool jacket. Compressors and diesel drives required in the air supply system are also noise producers. Use of mutes on air intakes, better mufflers on motor exhausts, and acoustic shields or barriers would reduce noise levels of this accessory equipment.

Riveting operations are also in the high noise category. Sounds thus produced can persist for long distances through massive steel structures. Dampening is extremely difficult if not impossible during normal work routines. However, change in operations is often possible through the use of squeeze-riveting equipment, or by employing alternate joining methods with less noise generation such as welding and use of high strength bolts.

Concrete mixers can be made less noisy by utilizing heavier construction of the mixing bucket or by employing a sound-absorbing coating on the inside shell, and consideration should also be given to using reinforced plastic gears.

Attention in the engineering design and specification writing phases of new industrial plant projects can also help in the reduction of construction noise levels. The designer and specification writer must keep in mind the construction methods and equipment that will be needed to meet their specified end requirements; alternate approaches allowing the use of less noise producing construction equipment and methods should be specified whenever possible.

A major advancement in the state of the art of noise abatement in industrial plant construction can be realized if permissible standards of sound pressure or sound power levels are assigned to specific items of construction equipment. Manufacturers should be required to produce sound pressure level data, frequency composition, and other broadcast characteristics of their products. Unfortunately, only a limited amount of data is currently reported by construction equipment manufacturers. The construction industry will have to take the responsibility for obtaining noise level data on equipment under actual operating conditions.

A uniform basis for reporting sound pressure levels must be agreed upon by the various equipment manufacturers. For each type of equipment, operating conditions, distance—measurement criteria, and directionality characteristics must be developed under controlled environment.

If noise abatement programs are accelerated, as has been the case with other pollution abatement programs, the impact on the industrial plant construction industry may be startling. Well-meaning regulations unless prudently imposed may result in greatly increased costs on industrial plant projects which are already staggering under ever mounting wage rates and reduced worker productivity. Work slowdowns or stoppages could easily occur until construction methods are revised and equipment is modified or replaced to meet legislative requirements for noise abatement. Careful attention must be given to the establishment of reasonable noise abatement standards for the construction industry and also to the planning of a time table for step-wise enforcement so that the costs of compliance do not become excessive. Such excessive costs if encountered would ultimately

be passed on to the industrial plant owners and would serve to further deter the capital expansion programs of industry which are already so badly crippled as to be currently hardly existent in most industries with which we are familiar.

STATEMENT OF HOWARD C. ROBERTS

May I offer these comments as a contribution to your series of hearings on noise abatement and control? Although they are related to the subjects of several hearings in the series, they pertain most to the last, dealing with the interaction between local, State, and Federal agencies.

The evidence with regard to the adverse effects of noise (both to the individual and to society) is so comprehensive, and of such long standing, that I do not wish to dwell on it. I do wish to mention some points which have had little public attention, but which seem to me important, and which I think can be treated practically.

(1) There are many installations (commercial airports, automobile and truck depots, and repair shops, some places of entertainment, animal shelters and boarding kennels, race tracks, and some others) where noise is produced on the premises but by devices not owned by the owner of the premises. Regulating these is made difficult because of the division of responsibility. I suggest regulations holding the owner of the premises responsible if the noise source was operated by him or his agent, the owner of the device responsible if the noise occurred by his action. The consequence of such regulations, in many cases, would be the location of such installations away from residential areas.

(2) For some years the FHA has had recommendations for noise-control construction in multifamily housing, used (as I understand) by them only when the construction was at least partly financed through FHA. In my opinion, all multiunits housing (apartments, condominiums, hotels, and motels, etc.) should be required to provide both fire resistance and noise isolation in all party walls, at least. The dual requirement does not add to building costs, but does simplify design and administration.

(3) Residential building codes could well contain noise-control items, and building permits should be granted only after plans are submitted containing acceptable noise-control provisions. A prospective purchaser or renter could then learn to what specifications the building was constructed by application to the city clerk's office. Since integrity in construction is almost as important as proper design, it is likely that sufficiently detailed inspection to insure uniformly good results would be impractical, but this kind of regulation would protect the consumer by placing responsibility at the right place.

(4) The problem of applying and enforcing regulations seems to me to be far more difficult than the technical problems of making corrections or new designs. The technical knowledge has been available for many years, but it has not been widely disseminated, nor, in the few universities where course work has been offered, has it usually been presented as an organized body of knowledge. Instead, through various publicity and advertising channels, incomplete and often incorrect information has been widespread. Further, noise regulations will be extremely difficult to enforce (except in a few specific situations) unless they are thought acceptable by the general public. In my opinion, a campaign to educate the public is badly needed. (I do not overlook the fact that we have gained much in the last few years; I remember only too well when speaking out against noise was made difficult for us.)

(5) In the enforcement of noise regulations, problems of measurement and of sampling (sample-preservation is impractical) are difficult, and court actions are likely to be expensive and inconclusive. I suggest that one means of countering this would be to make referees available at many points in the Nation. These should be competent people, acceptable both to the government agency and to others; they should not be thought of as either company men or government men.

(6) I would urge that schools, hospitals, and public buildings be subject to regulation in the areas of noise control and of illumination. These are buildings over which the individual has no jurisdiction but must occupy part of the time. Architect's specifications should contain provisions covering quality of illumination and amounts and sources of noise, and the architect should be held contractually responsible for them. Both noise control and

lighting are areas in which the knowledge has long been available, but not much used.

These items are only a few that seem to me important; I have selected those which I think have had least public notice. I thank you for the opportunity of mentioning them.

STATEMENT OF THE EXECUTIVE BOARD OF THE
CONFERENCE OF STATE SANITARY ENGINEERS
BACKGROUND STATEMENT AND FINDINGS

The increasing growth of complex metropolitan communities and the continued acceleration and expansion of technology emphasize the necessity for constant and planned attention to problems of environmental health.

Traditionally, environmental health practice has focused largely on problems associated with living organisms which affect health. These efforts must be expanded to embrace stresses that are more subtle and long range in their effects. Communities consider noise to be a significant environmental health stress. Urban attitudes about their residential environment are related to the perception of noise as a community liability. Certain social and physical variables are found to correlate highly with noise annoyance.

In 1968 the Public Health Service supported a National Conference on Noise as a Public Health Hazard. This was the first and, to date, only national conference on noise as a public health hazard. The conference included industrial noise as well as community noise.

In 1969 the Congress passed the Federal Coal Mine Health and Safety Act (Public Law 91-173) which directs the NIOSH, DHEW, to promulgate through the Department of the Interior regulations protecting the hearing of miners. In 1970 the Occupational Safety and Health Act (Public Law 91-596) provided the legislative authority for NIOSH to transmit recommended standards to OSHA (Department of Labor) for promulgation of regulations which would protect essentially all of the Nation's civilian work force.

In 1969 the Conference of State Sanitary Engineers' Committee on General Environmental Health included noise in its area of responsibility.

In 1970, CSSE adopted a resolution which petitioned the Administrator, Environmental Health Service, Public Health Service, Department of Health, Education, and Welfare, to designate a single agency to address itself to the problem of environmental noise, in particular its effects on health.

Before the end of 1970 the New York State Department of Environmental Conservation planned to have an effective noise control program. Such program plans were to identify and categorize the existing sources of noise; develop vigorous statewide standards and conduct noise surveillance activities and other actions.

It is obvious that attitudes concerning noise as a health hazard now are analogous with attitudes toward air pollution, water supply, the disposal of garbage and refuse, sewerage and drainage. The problem of noise is not expected to subside; in fact, there is growing concern that it is increasing. A national effort to improve and protect the community from noise is a logical and necessary step.

There is great need to develop specific knowledge as to the nature of the problem, its scope, and its significance in terms of health and well being. There is need for standards as a base for development of reasonable and proper community noise regulations. It is only from broad involvement of this nature that a bold, long range attack will be made in solving problems of community noise.

In view of the foregoing, the Conference of State Sanitary Engineers recommends that the Environmental Protection Agency be provided the necessary legislative authority and adequate funds to:

(1) Establish a national research and development program for improvement in community noise control and as a part of such program should:

(a) Conduct, promote, coordinate, and accelerate research, investigations, experiments, training, demonstrations, and studies concerning the mechanisms for communities and metropolitan and urban areas to meet control of noise; and

(b) Cooperate with, render technical services, and provide financial assistance to appropriate public and private agencies, institutions, and organizations in the conduct of such activities.

In effecting the program the Environmental Protection Agency should have authority to:

- (a) Collect and make available, through publications and other appropriate means, information and results of such activities including recommendations in connection therewith;
- (b) Cooperate with other Federal departments and agencies, with the State community noise regulatory agency, and with other public and private agencies, institutions, and organizations involved in the preparation of conduct of such research and other activities.
- (c) Make grants to the State agency responsible for the control of community noise for program improvement and extension purposes;
- (d) Make project grants to the State agency responsible for the control of community noise and through this agency to public and nonprofit agencies, institutions and organizations for demonstrations, surveys, and special studies.
- (e) Provide training for, and make training grants to personnel of the State agency responsible for the control of community noise and, with the approval of this State agency, to other personnel with suitable qualifications; and
- (f) Establish and maintain research fellowships as public nonprofit private educational institutions or research organizations.

(2) The Environmental Protection Agency be given legislative authority to make grants to the State agency responsible for the control of community noise for the purpose of developing, establishing, or improving such noise control programs.

Such programs would take into consideration the need for technical consultation to local governments for the purpose of analysis of the community in relation to community resources, for guidance in the utilization and implementation of findings, and for analysis of community response. Consideration further would be given to the necessity for coordinated and cooperated efforts with other public and private agencies engaged in noise evaluation for communities and metropolitan and urban areas.

To be eligible for such grants, States would be required to submit a plan—

- (a) Designating the State agency responsible for the control of community noise as the sole agency for carrying out the purposes of the community noise program; and
- (b) Prescribing the manner in which the program will be extended or improved.

Funds to be made available to States would be on a formula basis with the grant not to exceed two-thirds of the cost of developing, establishing, or improving community noise control programs.

Terms and conditions would be established as necessary for implementation of the program. In establishing regulations for the granting of funds the Environmental Protection Agency should, insofar as practicable, give due consideration to—

- (a) The population;
- (b) The extent of the actual or potential community noise problem; and
- (c) The financial need of the respective agencies.

Because the health of the individual is probably most seriously affected by noise exposure at his place of employment, the CSSE urges that the control of occupational exposure be fully implemented by the expansion of research efforts in the NIOSH, leading to development of comprehensive occupational exposure standards for implementation by OSHA (DOL).

Senator J. CALEB BOGGS,
Green Acres, Wilmington, Del.

DEAR SENATOR BOGGS: I am writing you today to complain about the unacceptable volume of Philadelphia International Airport traffic now existing in the skies of northern New Castle County. The situation has become intolerable.

I have chosen to write you, Senator, for these reasons: you are a fellow northern New Castle County resident and may have a "feel" for the problem; John Rollins recently called you the most influential man in the U.S. Senate; and because I was greatly impressed when you and that group of Senators that meets weekly in your office were men enough to publicly criticize the Nixon economic policy prior to announcement of price and wage controls.

There has been an enormous increase of Philadelphia air traffic over northern New Castle County and my house in the last 1 to 2 years. And, I think it has particularly increased this year. Most of this traffic consists of large jet planes which cause a loud shrill roar in addition to spewing exhaust garbage over our area. This racket and garbage is being dumped on people living 15 to 20 miles from the airport. My house in Kingsridge is at least 15 miles from the airport, and I am going to list my observations of recent months in my community.

(1) Before the roar of one jet plane dies away, you can hear another plane coming.

(2) The noise from one plane usually lasts for at least 60 seconds, and sometimes up to 90 seconds.

(3) Sometimes, pilots increase the roar by having the audacious gall to reverse their engines over our area.

(4) We get as many as 25 to 30 annoying planes in 1 hour.

(5) One night in a 3-hour period, I estimate that 80 to 100 planes went directly over the area near my house.

(6) Some planes are so low that you can't get an entire plane in the view of normal 7 x 35 binoculars.

(7) The racket may occur any day at almost any time—such as 7:15 a.m. Sunday or at midnight any night.

(8) Standing outside the house, some planes are so loud when directly overhead that you can't hear a person talking just 3 feet away. Most planes drown out conversation between persons 10 feet apart. This, of course, eliminates TV use of our patio, generally drowns out the sound of our running water fountain next to the patio, and for the most part restricts our enjoyment of the patio. This is not good.

(9) Inside my house with doors and windows open, you can't hear the stereo in the next room; you can't hear someone calling to you in the next room; and you can't even understand what a TV announcer is saying for up to 30 seconds.

(10) With the house closed up tight, you must often strain to hear the TV. My wife is pregnant and needs to sleep; this racket isn't helping her.

Let me repeat, Senator, every one of the preceding 10 items occurs not just 5 miles from the airport, but as far away as 15 to 20 miles. This is incredible.

I'm not implying that the racket is always present. However, the volume we receive is clearly unsatisfactory. Sometimes there are no planes for 2 or 3 days; but then they will resume worse than ever for a week or more.

When we moved into our house 5 years ago, the air traffic was very light with relatively few planes daily. Since that time, however, the traffic has gotten heavier and heavier to an utterly intolerable point. We've reached the point where on most days, the racket begins early in the morning and continues off and on until late at night; volume statistics include more than 100 planes per day near my house with peak periods of 25 to 30 planes per hour. This won't do, Senator.

Recently, I read that the airport expects to handle four times its current passenger volume by 1985. Can I assume that the air traffic over Delaware will be four times worse in 1985? It better not be that bad.

And by the way, Senator, what right does any Philadelphia based outfit have to dump garbage on any part of Delaware. Exhaust and noise from planes is just garbage. Is this progress—I think not.

You can see that I'm incensed by this situation. I'm outraged because my family is subjected to this crap. What kind of place is this for my 16-month-old daughter to grow up in?

I've had enough, Senator. Something has got to be done immediately to reduce the Philadelphia air traffic over northern New Castle County. It is inconceivable to expect thousands and thousands of families living 15 to 20 miles from the airport to put up with this nonsense.

These planes don't have to go over Delaware. Let them shorten the circling patterns to keep these planes out of Delaware. At the very least, let's reduce the volume of traffic over Delaware and prohibit Philadelphia bound planes from flying so low over our area. To let the present situation continue is unthinkable.

I look forward to your prompt attention to this matter. If there is one person who can adjust this situation, it's you, Senator Boggs. Thank you.

Sincerely,

CHARLES J. LUTZ, JR.

STATEMENT OF HAROLD J. NEWMAN

My name is Harold J. Newman and I reside at 431 Brown's Lane, Pittsburgh, Pa. 15237. I have never before submitted testimony in any hearing, but I feel so strongly about the need for an effective noise abatement program that I want to be heard on this occasion.

My wife and I have resided at our present address for almost 12 years. At the time we moved here it was a relatively quiet neighborhood. Over the years, however, the increase in population and traffic has led to a noise level around the clock that is destructive of good sleep or any kind of relaxation.

I am not a technically educated person and I do not know much about decibels and other jargon of acoustical engineering. I can tell you, however, that one does not need to be an engineer to recognize the disturbance of an automatic garbage and trash processing vehicle which drives up below his bedroom window at 2 a.m.

A steady stream of monstrous trucks and buses now passes within a quarter mile of our residence and the constant roar and reverberation is nerve-wracking. Ironically, our State legislature is under pressure to permit increased truck sizes on our highways, yet nothing has been said about noise.

A third major source of noise intrusion emanates from minibikes and motorcycles which cruise our neighborhood and adjacent residential and commercial neighborhoods at will, contaminating the air with their ugly, machine gun-like sputtering.

My wife has developed a persistent skin rash and I suffer from tension headaches. Both of these afflictions, I feel, are at least related to the intolerable noise level and the resultant loss of sleep. There is scarcely a night that my wife and I are able to sleep undisturbed.

Why don't we move? Frankly, we cannot afford to. And where would we go to be sure that ultimately the same conditions would not prevail?

I am convinced that local authorities cannot or will not cope with the situation. I doubt that they are even aware that noise is a problem. If one man threatens another man's health with a knife in the presence of a police officer that officer would undoubtedly intervene. Yet the slow and subtle destruction of health by those who pollute with excessive noise draws little, if any, attention. I have seen mufflerless motorcycles roar past police cars with nothing more than a glance from the officers inside.

I am also convinced that legislation at the national level can accomplish a turnaround in this ever-increasing type of environmental pollution. Standards should and must be established which will require manufacturers to design into their products reasonable consideration for noise abatement. If control is not begun at the source then there can be no hope of eventual success in coping with this problem.

I urgently request that Federal legislation toward this end be developed and enacted.

STATEMENT OF FRED G. EVENDEN

It is my personal experience and opinion that noise is one of today's major detractants from a wholesome and peaceful environment. Let me give you an example or two:

(1) Our home is located 17 miles from National Airport, about 3 miles north of the Potomac River in Montgomery County, Md. We are just a few miles outside the noise-abatement-procedures-control zone for National with the following results: We cannot sit on our own back porch and visit when the aircraft pattern is in our direction. The roar of one fades away as the noise of the next plane builds up. Further, during the winter months when we are closed inside the house, the TV has to be on a louder volume than any of us really want it in order for the programs to be heard above the plane noise outside.

(2) Power mowers or chain saws even more than a block away are extremely bothersome in this residential neighborhood.

(3) Incessantly barking dogs unattended by neighborhood owners often wake one at unreasonable hours at night and prove distracting in what should be a peaceful neighborhood during the day.

(4) Although we are at least one-half mile from the beltway in a well-forested neighborhood, the roar of traffic is an obvious distraction at almost any hour of those nights when we sleep with the bedroom windows open.

It is hoped that the findings of the EPA hearings will result in steps being taken to improve air and ground traffic noise problems on a national basis, and in the strengthening of local government ordinances for the control of neighborhood noises.